SERVICE MANUAL

150 AND 300 WATT
ELECTRONIC LOAD MODULES
Agilent 60501B AND 60502B

Part No. 5951-2830

SERVICE MANUAL
FOR INSTRUMENTS WITH SERIAL NUMBERS
Agilent 60501B US37240101 AND ABOVE
Agilent 60502B US37240101 AND ABOVE

For instruments with higher Serial Numbers, a change page may be included.

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CERTIFICATION

Agilent Technologies certifies that this product met its published specifications at time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.

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The above statements apply only to the standard product warranty. Warranty options, extended support contracts, product maintenance agreements and customer assistance agreements are also available. Contact your nearest Agilent Technologies Sales and Service office for further information on Agilent Technologies' full line of Support Programs.

SAFETY SUMMARY

The following general safety precautions must be observed during all phases of operation, service and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

BEFORE APPLYING POWER.
Verify that the product is set to match the available line voltage and the correct fuse is installed.

GROUND THE INSTRUMENT.
This product is a Safety Class 1 instrument (provided with a protective earth terminal). To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument must be connected to the ac power supply mains through a three-conductor power cable, with the third wire firmly connected to an electrical ground (safety ground) at the power outlet. For instruments designed to be hard-wired to the ac power lines (supply mains), connect the protective earth terminal to a protective conductor before any other connection is made. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury. If the instrument is to be energized via an external autotransformer for voltage reduction, be certain that the autotransformer common terminal is connected to the neutral (earth pole) of the ac power lines (supply mains).

FUSES.
Only fuses with the required rated current, voltage and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short-circuited fuseholders. To do so could cause a shock or fire hazard.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE.
Do not operate the instrument in the presence of flammable gases or fumes.

KEEP AWAY FROM LIVE CIRCUITS.
Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified service personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power, discharge circuits and remove external voltage sources before touching components.

DO NOT SERVICE OR ADJUST ALONE.
Do not attempt internal service or adjustment unless another person capable of rendering first aid and resuscitation, is present.

DO NOT EXCEED INPUT RATINGS.
This instrument may be equipped with a line filter to reduce electromagnetic interference and must be connected to a properly grounded receptacle to minimize electric shock hazard. Operation at line voltages or frequencies in excess of those stated on the line rating label may cause leakage currents in excess of 5.0 mA peak.

SAFETY SYMBOLS.

⚠ Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual (refer to Table of Contents) .

Indicates hazardous voltages.

or Indicate earth (ground) terminal.

WARNING The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

CAUTION The CAUTION sign denotes a hazard. It calls attention to an operating procedure, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT.
Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to an Agilent Technologies Sales and Service Office for service and repair to ensure that safety features are maintained.

Instruments which appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

Table of Contents

1

General Information

About This Manual

This manual is designed to be used along with the Agilent 6050A/6051A Service Manual. It includes service information that is specific to the 60501B/60502B Modules. Troubleshooting information such as fault isolation, signature analysis, and block-level troubleshooting is the same for all modules and is found in the Agilent 6050A/6051A Electronic Load Mainframe Service Manual. The mainframe Service Manual also explains how to safely disassemble and connect the module to the mainframe for troubleshooting.

Typically, you will need to refer to this manual when you are performing the verification routines, locating a test point on the component/test point diagram, referring to the schematics for additional troubleshooting information, and initializing the module after replacing the EEPROM.

You will also need to refer to this manual for identifying and locating replaceable parts. The parts list identifies all replaceable parts in the module, and the component/test point diagram identifies the location of all electrical parts in your module.

Troubleshooting Precautions

WARNING Use extreme caution when troubleshooting the module when it is connected to the mainframe. AC mains voltage is present on the exposed pins on the top edge of the mainframe GPIB board and each module whenever the units are turned on.

CAUTION Observe all standard antistatic procedures when handling the module assemblies to avoid the possibility of electrostatic damage (refer to mainframe Service Manual) .

To reduce the risk of electrical shock when troubleshooting a defective module, make sure the GPIB board is installed in the mainframe. Also, to make it easier to troubleshoot the module, connect the module to the GPIB board using an extender service cable (P/N 06050-60030). This cable is included with the Service kit (P/N 06050-60004), which must be ordered separately.

Manual Revisions

Agilent Technologies instruments are identified by a ten-character serial number such as US37240101. This manual was written for Electronic Load Modules with serial numbers equal to and higher than those shown on the title page. If the serial number of your module is higher than the one shown on the title page, then the module may have hardware or firmware differences that are not covered in this manual. If there are such differences, they are documented in one or more Manual Change sheets sent with this manual.

Module Initialization

EEPROM chip U342 on the Control Board stores the module's GPIB address and model number as well as other constants. The EEPROM was programmed with the proper constants at the factory. If the Control board or the EEPROM chip (U342) is replaced, the module must be reinitialized with the proper constants by programming the following commands in the order indicated. After it has been initialized, the module must also be recalibrated as described in the Operating Manual.

60501B Initialization

"CAL 1"	**! turn calibration mode on**
"CAL: INIT 60 , 30	**! initialize default calibration parameters**
"CAL:SAVE"	**! store calibration constants in EEPROM**
"DIAG:CAL:SEC -5035"	**! model number**
"DIAG: CAL: SEC 1 , 16896"	**! model number suffix**
"DIAG: CAL: SEC 26 , 1	**! module width**
"DIAG: CAL: SEC 27 , 1"	**! module type**
"DIAG: CAL: SEC 28 , 17800"	**! voltage for soft over power**
"DIAG:CAL:SEC 29 , 8900"	**! current for soft over power**
"*RST"	**! reset factory default state**
"CURR : SLEW 0.5E6"	**! turn on slew rate**
"*SAV 0"	**! to location 0**
"CAL 0"	**! turn calibration mode off**

60502B Initialization

"CAL 1"	**! turn calibration mode on**
"CAL: INIT 60 , 60	**! initialize default calibration parameters**
"CAL:SAVE"	**! store calibration constants in EEPROM**
"DIAG:CAL:SEC -5034"	**! model number**
"DIAG: CAL: SEC 1 , 16896"	**! model number suffix**
"DIAG: CAL: SEC 26 , 1"	**! module width**
"DIAG: CAL: SEC 27 , 1"	**! module type**
"DIAG: CAL: SEC 28 , 17804"	**! voltage for soft over power**
"DIAG:CAL:SEC 29 , 17804"	**! current for soft over power**
"*RST"	**! reset factory default state**
"CURR : SLEW 1.0E6"	**! turn on slew rate**
"*SAV 0"	**! to location 0**
"CAL 0"	**! turn calibration mode off**

2

Verification

Introduction

This chapter contains test procedures that check the operation and calibration of the Agilent 60501B/60502B Electronic Load Modules. The tests are performed from the front panel of an Agilent 6050A/6051A Electronic Load Mainframe with the module installed in slot 1. The tests can also be used to determine which circuits are faulty when troubleshooting. There are some transient, trigger, and pulse functions that require an GPIB controller and will not be verified with manual testing from the front panel. The following tests will verify, with a high level of confidence, that the module is operating properly without testing all of its capabilities.

At the end of this chapter are performance record tables where actual measured values can be recorded.

Test Equipment Required

Table 2-1 lists the test equipment required to perform the tests in this chapter. Test setups for the tests are shown in Figures 2-1 through 2-3. Make sure the sense switch on the rear of the module is set to the LCL position since local sensing is used in all of the test setups. Use adequate wire gauge when making connections (see Chapter 3 in the Operating Manual).

Note The Electronic Load must pass the selftest at power turn-on before the following tests can be performed. If the unit fails selftest, refer to the overall troubleshooting procedures in the mainframe Service Manual.

Table 2-1. Test Equipment Required for Verification

Type	Required Characteristics	Recommended Model
60V/60A Source	0 to 20V/0 to 120A 0 to 60V/0 to 50A	Agilent 6031A or equivalent Agilent 6032A or equivalent
Current Monitor Resistor	0.10 ohms @ 15A 0.04% @ 25W	Guideline 9230/15
Current Monitor Resistor	0.010 ohms @ 100A 0.04% @ 100W	Guideline 9230/100
Digital Voltmeter	dc accuracy of 0.01% 6 digit readout	Agilent 3455A, 3456A, or 3458A
Current Probe with Amplifier and Power Supply	Sensitivity of 1mA/10 mV to 50MHz with less than 300µA of noise to 5MHz.	Tektronix A6302 probe, AM503 probe amplifier, and TM501 probe power supply.
Oscilloscope	Sensitivity: 1mV Bandwidth: 20MHz	Agilent 54504

CC Mode Test

This test verifies that the module operates in the CC Mode and that the current programming and readback to the front panel display are within specifications. For each DMM reading, the front panel display should be equal to:

60501B: DMM reading in amps ± ((DMM reading in amps x 0.0006) + 0.040).
60502B: DMM reading in amps ± ((DMM reading in amps x 0.0005) + 0.065).

If the test readings significantly disagree with the specified values or no readings can be recorded, perform the CC MODE TEST troubleshooting procedures in Figure 3-1 in Chapter 3 of the mainframe Service Manual. If the readings are out of tolerance, calibrate the applicable current range (see Chapter 6 in the Operating Manual).

a. Connect the Electronic Load, power supply (Agilent 6031A or equivalent), DMM, and the 0.010 ohm current monitor resistor as shown in Figure 2-1.

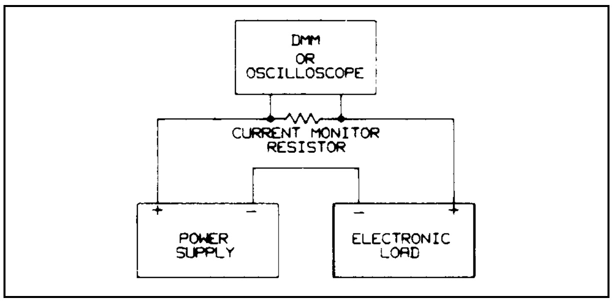


Figure 2-1. Test Setup A

b. Turn on the Electronic Load.

c. Check the high amp current range as follows:

1. Press [MODE] [CURR] [Enter], then
60501B: [CURR] [3] [0] [Enter] .
60502B: [CURR] [6] [0] [Enter] .

2. Turn on the power supply and set for:
60501B: 5V and >30A.
60502B: 5V and >60A.

3. Wait 30 seconds and then record the DMM and front panel display readings. DMM reading should be between:
60501B: 299.3mV (29.930A) and 300.7mV (30.070A).
60502B: 598.6mV (59.86A) and 601.3 mV (60.135A).
Note that the Electronic Load's CC annunicator is on.

4. Press [CURR] [1] [Enter] .

5. Wait 30 seconds then record the DMM and front panel display readings. DMM reading should be between:
60501B: 9.59mV (0.959A) and 10.41mV (1.041A).
60502B: 9.24mV (0.924A) and 10.76mV (1.076A).

d. Check the low current range as follows:

1. Press

60501B: Range 3 Enter then CURR 3 Enter.

60502B: Range 6 Enter then CURR 6 Enter .

2. Wait 10 seconds then record the DMM and front panel display readings. DMM reading should be between:

60501B: 29.57mV (2.957A) and 30.43mV (3.043A).

60502B: 59.19mV (5.919A) and 60.81mV (6.081A).

3. Press CURR 1 Enter .

4. Wait 10 seconds and record the DMM and front panel display readings. DMM reading should be between:

60501B: 9.59mV (0.959A) and 10.41mV (1.041A).

60502B: 9.24mV (0.924A) and 10.76mV (1.076A).

CV Mode Test

This test verifies that the module operates in the CV Mode and that the voltage programming and readback to the front panel display are within specifications. For each DMM reading, the corresponding front panel display should be equal to:

DMM reading ± ((DMM reading x 0.0005) + .045).

Note that if the test readings significantly disagree with the specified values or no readings can be recorded, perform the CV MODE TEST troubleshooting procedures in Figure 3-1, in Chapter 3 of the mainframe Service Manual. If the readings are out of tolerance, calibrate the voltage range (see Chapter 6 in the Operating Manual).

a. Connect the Electronic Load, power supply (HP6032A or equivalent), and DMM as shown in Figure 2-2. Take care in making connections so that contact resistance voltage drop will not affect the readings.

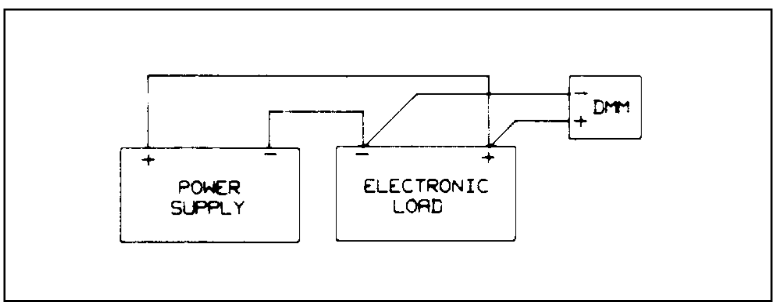


Figure 2-2. Test Setup B

b. Press MODE VOLT Enter , then VOLT 6 0 Enter .

c. Set power supply for:

60501B: 61V and 2A.

60502B: 61V and 5A.

d. Record the DMM and front panel display readings. DMM reading should be between 59.890V and 60.110V. Note that the Electronic Load's CV annunciator is on.

e. Press [VOLT] [3] [Enter] .

f. Record the DMM and front panel display readings. DMM reading should be between 2.947V and 3.053V.

CR Mode Test

This test verifies that the module operates in the CR Mode and that the resistance programming is within specifications. The programmed resistance values are checked by recording the voltage across the current monitor resistor and the input voltage (voltage across the module's input terminals), and then calculating the resistance value as follows:

Load resistance = Input voltage/(voltage across resistor/resistor value)

Note if the calculation significantly disagrees with the specified range of values, perform the CR MODE TEST troubleshooting procedures in Figure 3-1 in Chapter 3 of the mainframe Service Manual. If the calculation is out of tolerance, calibrate the applicable resistance range (see Chapter 6 in the Operating Manual).

a. Connect the Electronic Load, power supply (Agilent 6032A or equivalent), and the 0.10 ohm current monitor resistor as shown in Figure 2-1. Use the DMM to measure the voltage across the monitor resistor and across the module's input terminals.

b. Check the low ohm range as follows:

1. Press [MODE] [RES] [Enter] , then
60501B: [Range] [1] [Enter] ; [RES] [1] [.] [9] [Enter] .
60502B: [Range] [0] [.] [9] [Enter] ; [RES] [1] [Enter] .

2. Turn on power source and set for:
60501B: 15V and 5.5A.
60502B: 15V and 10.9A.
For the low ohm range test, the power supply will operate in the current limit mode.

3. Measure the voltage across the monitor resistor and across the module's input terminals, then calculate the Electronic Load resistance. The result should be between:
60501B: 1.868 and 1.931 ohms.
60502B: 0.984 and 1.016 ohms.
Note that the Electronic Load's CR annunciator is on.

4. Then press:
60501B: [RES] [0] [.] [0] [7] [Enter].
60502B: [RES] [0] [.] [0] [5] [Enter] .

5. Measure the voltage across the monitor resistor and across the module's input terminals, then calculate the Electronic Load resistance. The result should be between:
60501B: 0.0534 and 0.0866 ohms.
60502B: 0.0416 and 0.0584 ohms.

c. Check the middle ohms range as follows:

1. Press [Range] [1] [0] [Enter] , then
60501B: [RES] [6] [0] [Enter].
60502B: [RES] [3] [0] [Enter].

2. Set power supply for:
60501B: 10.9V and 8A.
60502B: 10.9V and 15A.

3. Measure the voltage across the monitor resistor and across the module's input terminals, then calculate the Electronic Load resistance. The result should be between:
60501B: 46 and 86 ohms.
60502B: 24.1 and 39.6 ohms.

4. Then press:
60501B: [RES] [2] [Enter] .
60502B: [RES] [1] [Enter] .

5. Measure the voltage across the monitor resistor and across the module's input terminals, then calculate the Electronic Load resistance. The result should be between:
60501B: 1.97 and 2.03 ohms.
60502B: 0.989 and 1.011 ohms.

d. Check the high ohms range as follows:

1. Press: [Range] [2] [0] [0] [1] [Enter] , then
60501B: [RES] [2] [0] [0] [Enter].
60502B: [RES] [1] [2] [0] [Enter]

2. Set power source for:
60501B: 60V and 5A.
60502B: 60V and 6A.

3. Measure the voltage across the monitor resistor and across the module's input terminals, then calculate the Electronic Load resistance. Calculation should be between:
60501B: 99.8 and 10K ohms.
60502B: 61.1 and 3243 ohms.

4. Then press:
60501B: [RES] [2] [4] [Enter] .
60502B: [RES] [1] [2] [Enter] .

5. Measure the voltage across the monitor resistor and across the module's input terminals, then calculate the Electronic Load resistance. The result should be between:
60501B: 21.4 and 27.3 ohms.
60502B: 10.9 and 13.3 ohms.

Transient Operation and Slew Circuit Test

This test verifies transient and slew circuit operation. The slew circuits cannot be calibrated. If slew rise time and/or fall time are not within specifications or the slew circuits are inoperative, perform either the "Transient Generator Troubleshooting", or the "Slew Circuit Troubleshooting" in Chapter 3 of the mainframe Service Manual.

a. Use the test setup of Figure 2-1 except connect an oscilloscope across the 0.10 current monitor resistor in place of the DMM. Set power supply for:
60501B: 5V and 5A.
60502B: 10V and 10A.

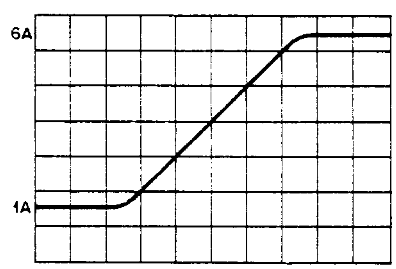
b. Recall the factory default values by pressing
[Recall] [7] [Enter] .

c. Select the low current range by pressing
60501B: [Range] [3] [Enter] .
60502B: [Range] [6] [Enter] .

d. Set up transient operation by pressing [CURR] [1] [Enter] , then
60501B: [Tran Level] [3] [Enter] .
60502B: [Tran Level] [6] [Enter] .

e. Set the slew rate to .05A/µs (50A/ms) by pressing
[ ] (blue shift key), then
[Slew] [0] [.] [0] [5] [Enter] , then [Tran on/off] .

f. Adjust the oscilloscope for a single rise or fall time display. Use delayed sweep. The rise time when measures from 10% to 90% or the fall time when measured from 90% to 10% should be between:
60501B: 30 and 50µs.
60502B: 75 and 125µs.
Note that the Electronic Load's **Tran** annunciator is on.



60501B: 10µs/DIV
60502B: 20µs/DIV
SLEW 0.05

g. Set the slew rate to .0025A/µs (2.5A/ms) by pressing [ ] (blue shift key), then
[Slew] [0] [.] [0] [0] [2] [5] [Enter] , then [Freq] [6] [0] [Enter] .

h. Adjust the oscilloscope for a single rise or fall time display. Use delayed sweep. The rise time when measured from 10% to 90% or the fall time when measured from 90% to 10% should be between:
60501B: 0.6 and 1.0ms.
60502B: 1.5 and 2.5ms.

CC Mode PARD Test

CC mode PARD (periodic and random deviations) is specified as the rms input current in a frequency range 20Hz to 10Mhz. This test checks CC Mode PARD.

a. Connect the Electronic Load, power supply (Agilent 6032A or equivalent, DMM, and current probe as shown in Figure 2-3. Set power supply for 10V and >10A.

b. Turn the load's ac power off then on.

c. Press [CURR] [1] [0] [Enter] .

d. DMM reading should be less than:
60501B: 2mA rms.
60502B: 4mA rms.

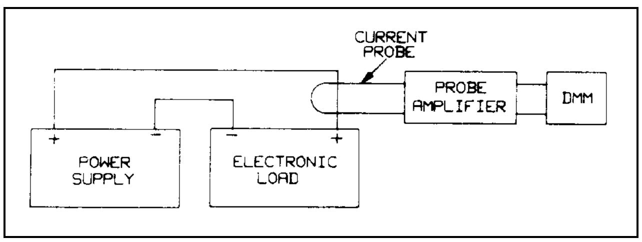


Figure 2-3. Test Setup C

CC Mode Power Limit

This test verifies that the module's power limit circuit is operating properly. If the results specified in steps d through i are not obtained, troubleshoot the circuits as described in "Overpower Circuits Troubleshooting" in Chapter 3 of the mainframe Service Manual.

CAUTION If the overpower circuit does not turn the load off within three minutes after performing step d, stop the tests and troubleshoot the overpower circuits.

a. Connect the Electronic Load and the power source as shown in Figure 2-2.

b. Turn on the Electronic Load and run for approximately five minutes with no power being dissipated (no input power).

c. Then press [MODE] [VOLT] [Enter], then [VOLT] [2] [0] [ENTER] .

d. Turn on and set the power supply for:
60501B: 34volts and 10mps.
60502B: 34volts and 18mps.

The Electronic Load's front panel should indicate between:
60501B: 33 volts and between 6 and 8 amps.
60502B: 33 volts and between 13 and 17 amps.
The front panel Prot annunciator should also be on.

e. Press **Meter** to display " – – OP", indicating that an overpower condition exists and the Electronic Load is in power limit.

f. Let the Electronic Load continue running. Within three minutes the Electronic Load should turn its input off, and the display should show "PS – – OP" indicating protection shutdown. IF THE OVERPOWER CIRCUIT DOES NOT TURN THE LOAD OFF WITHIN THREE MINUTES, STOP THE TESTS AND TROUBLESHOOT THE OVERPOWER CIRCUITS.

g. Immediately press **Prot Clear**. The "PS" display should blink and the input will remain shut down, indicating that protection shutdown is latched.

h. Wait approximately one minute and press **Prot Clear** again. This time the load should turn on with only "OP" displayed.

i. Reduce the power source output to 20 volts. The display should change to "– – –" indicating that the protection shutdown and overpower conditions are cleared.

PERFORMANCE TEST RECORD - Agilent 60501B LOAD MODULE (Page 1 of 2)

Test Facility:
_______________________________ Report No.______________________
_______________________________ Date___________________________
_______________________________ Customer_______________________
_______________________________ Tested by_______________________

Model **Agilent 60501B**
Serial No.______________________________
Options________________________________
Firmware Rev.___________________________

Ambient temperature ________________°C
Relative humidity__________________%
Line frequency_______________Hz (nominal)

Special Notes:
____
____
____

Test Equipment Used			
Description	**Model No.**	**Trace No.**	**Cal. Due Date**
1. AC Source			
2. DC Voltmeter	**Agilent 3458A**		
3. Oscilloscope	**Agilent 54504A**		
4. Power Source	**Agilent 6031A**		
5. Power Source	**Agilent 6032A**		
6. Current Probe			
7. Current Shunt	**Guildline 9230/15**		
8. Current Shunt	**Guildline 9230/100**		

PERFORMANCE TEST RECORD - Agilent 60501B LOAD MODULE (Page 2 of 2)

Model **Agilent 60501B**	Report No.____________________	Date________________________________

Test Description	Minimum Specification	Results	Maximum Specification	Measurement Uncertainty
		CONSTANT CURRENT MODE TESTS		
30 Ampere Range Programming and Readback				
High Current (30A)	29.930	____________A	30.070	12mA
Front Panel Display	A_{OUT} -0.058	____________A	A_{OUT} +0.058	12mA
Low Current (1A)	0.959	____________A	1.041	427µA
Front Panel Display	A_{OUT} -0.040	____________A	A_{OUT} +0.040	427µA
3 Ampere Range Programming and Readback				
High Current (3A)	2.957	____________A	3.043	1.2mA
Front Panel Display	A_{OUT} -0.041	____________A	A_{OUT} +0.041	1.2mA
Low Current (1A)	0.959	____________A	1.041	427µA
Front Panel Display	A_{OUT} -0.040	____________A	A_{OUT} +0.040	427µA
		CONSTANT VOLTAGE MODE TESTS		
Voltage Programming and Readback				
High Voltage (60V)	59.890	____________V	60.110	845µV
Front Panel Display	V_{OUT} -0.075	____________V	V_{OUT} +0.075	845µV
Low Voltage (3V)	2.947	____________V	3.053	35µV
Front Panel Display	V_{OUT} -0.046	____________V	V_{OUT} +0.046	35µV
		CONSTANT RESISTANCE MODE TESTS		
Low Resistance Range				
Resistance (1.9 Ω)	1.868	____________Ω	1.931	
Resistance (0.07Ω)	0.0534	____________Ω	0.0865	
Middle Resistance Range				
Resistance (60Ω)	46	____________Ω	86	
Resistance (2 Ω)	1.97	____________Ω	2.03	
High Resistance Range				
Resistance (200Ω)	99.8	____________Ω	10K	
Resistance (24Ω)	21.4	____________Ω	27.3	
		TRANSIENT SLEW TEST		
Fast Slew Transient				
Slew Rate 0.05 A/µs	30	____________µs	50	
Slew Rate 2.5 A/ms	0.6	____________ms	1.0	
		CONSTANT CURRENT PARD TEST		
Current (10A)	0	__________mA	2mA RMS	

PERFORMANCE TEST RECORD - Agilent 60502B LOAD MODULE (Page 1 of 2)

Test Facility:

______________________ Report No.______________________
______________________ Date______________________
______________________ Customer______________________
______________________ Tested by______________________

Model **Agilent 60502B** Ambient temperature ______________°C
Serial No.______________________ Relative humidity ______________%
Options______________________ Line frequency ______________Hz (nominal)
Firmware Rev.______________________

Special Notes:

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____
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	Test Equipment Used		
Description	**Model No.**	**Trace No.**	**Cal. Due Date**
1. AC Source			
2. DC Voltmeter	**Agilent 3458A**		
3. Oscilloscope	**Agilent 54504A**		
4. Power Source	**Agilent 6031A**		
5. Power Source	**Agilent 6032A**		
6. Current Probe			
7. Current Shunt	**Guildline 9230/15**		
8. Current Shunt	**Guildline 9230/100**		

PERFORMANCE TEST RECORD - Agilent 60502B LOAD MODULE (Page 2 of 2)

Model **Agilent 60502B**	Report No.____________________	Date________________________________

Test Description	Minimum Specification	Results	Maximum Specification	Measurement Uncertainty
		CONSTANT CURRENT MODE TESTS		
60 Ampere Range Programming and Readback				
High Current (60A)	59.865	_____________A	60.135	25mA
Front Panel Display	A_{OUT} -0.095	_____________A	A_{OUT} +0.095	25mA
Low Current (1A)	0.924	_____________A	1.076	427µA
Front Panel Display	A_{OUT} -0.065	_____________A	A_{OUT} +0.065	427µA
6 Ampere Range Programming and Readback				
High Current (6A)	5.919	_____________A	6.081	2.4mA
Front Panel Display	A_{OUT} -0.068	_____________A	A_{OUT} +0.068	2.4mA
Low Current (1A)	0.924	_____________A	1.076	427µA
Front Panel Display	A_{OUT} -0.065	_____________A	A_{OUT} +0.065	427µA
		CONSTANT VOLTAGE MODE TESTS		
Voltage Programming and Readback				
High Voltage (60V)	59.890	_____________V	60.110	845µV
Front Panel Display	V_{OUT} -0.075	_____________V	V_{OUT} +0.075	845µV
Low Voltage (3V)	2.947	_____________V	3.053	35µV
Front Panel Display	V_{OUT} -0.046	_____________V	V_{OUT} +0.046	35µV
		CONSTANT RESISTANCE MODE TESTS		
Low Resistance Range				
Resistance (1Ω)	0.984	_____________Ω	1.016	
Resistance (0.05Ω)	0.0416	_____________Ω	0.0584	
Middle Resistance Range				
Resistance (30Ω)	24.1	_____________Ω	39.6	
Resistance (1Ω)	0.989	_____________Ω	1.011	
High Resistance Range				
Resistance (120Ω)	61.1	_____________Ω	3243	
Resistance (12Ω)	10.9	_____________Ω	13.3	
		TRANSIENT SLEW TEST		
Fast Slew Transient				
Slew Rate 0.05 A/µs	75	_____________µs	125	
Slew Rate 2.5 A/ms	1.5	_____________ms	2.5	
		CONSTANT CURRENT PARD TEST		
Current (10A)	0	__________mA	4mA RMS	

Replaceable Parts

Introduction

Tables 3-3 and 3-4 list the electrical components and Table 3-5 lists the mechanical components for the Agilent 60501B/60502B Electronic Load Modules. These tables provide the following information.

- Reference designation (see Table 3-1).
- Agilent part number.
- Description of part (see Table 3-2).

Refer to Figures 4-2 and 4-4 for component locations.

Table 3-1. Reference Designators

A	Assembly	RTB	Removable Terminal Block
B	Blower	RTP	Removable Jumper
C	Capacitor	S	Switch
D	Diode	T	Transformer
F	Fuse	TB	Terminal Block
J	Terminal Jack	TBP	Test Pin
MP	Mechanical Part	U	Integrated Circuit
P	Terminal Plug	VR	Voltage Regulator
Q	Transistor	W	Cable Assembly
RT	Thermal Resistor	Y	Oscillator

How To Order Parts

You can order parts from your local Agilent Technologies sales office (refer to the list at the end of this manual for the office nearest you). When ordering parts, include the following information:

- Agilent part number.
- Description of the part.
- Quantity desired.
- Electronic Load model number (Agilent 60501B).

Table 3-2. Part Description Abbreviations

AL	Aluminum	PE	Polyester
CC	Carbon Composition	PD	Power Dissipation
CER	Ceramic	PP	Polypropylene
DIP	Dual In-Line Package	PWR	Power
DPDT	Double Pole Double Throw	RECT	Rectifier
FF	Flip Flop	SIP	Single In-Line Package
FXD	Fixed	TA	Tantalum
GEN-PURP	General Purpose	TC	Temperature Coefficient
IC	Integrated Circuit	TF	Thin Film
MACH	Machine	W/	With
MO	Meta1 Oxide		

Table 3-3. Agilent 60501B/60502B Control Board - Electrical Parts

Reference Designation	Agilent Part Number	Description
	60502-60027	**CONTROL BOARD**
C301	0180-0405	CAPACITOR-FXD 1.8µF ±10% 20Vdc TA
C302	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C303,304	0160-4807	CAPACITOR-FXD 33pF ± 5%100Vdc CER 0±30
C306,307	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C311	0160-6579	CAPACITOR-FXD 2200pF ±2.5% 100Vdc PP
C312	0160-5349	CAPACITOR-FXD 200pF ±5% 100Vdc CER 0±30
C314-317	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C323-327	0160-5422	CAPACITOR-FXD .047uF ±20% 50Vdc CER
C329	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C330	0160-4787	CAPACITOR-FXD 22pF ±5% 100Vdc CER 0 ±30
C331-337	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C339	0160-4787	CAPACITOR-FXD 22pF ±5% 100Vdc CER 0 ±30
C340,341	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C342	0160-4822	CAPACITOR-FXD 1000pF ±5% 100Vdc CER 0±30
C343	0160-4835	CAPACITOR-FXD .1µF ±10% 50Vdc CER
C344	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C345	0160-4835	CAPACITOR-FXD .1µF ±10% 50Vdc CER
C346,347	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C348	0160-4787	CAPACITOR-FXD 22pF ±5% 100Vdc CER 0±30
C349,350	0180-4112	CAPACITOR-FXD 1700µF+30-10% 50Vdc AL
C351	0180-4131	CAPACITOR-FXD 4.7µF ±10% 35Vdc TA
C352	0180-3804	CAPACITOR-FXD 47µF ±20% 35Vdc TA
C353	0180-4131	CAPACITOR-FXD 4.7µF ±10% 35Vdc TA
C357,359	0160-4800	CAPACITOR-FXD 120pF ±5% 100Vdc CER 0 ±30
C363	0160-4820	CAPACITOR-FXD 1800pF ±5% 100Vdc CER 0±30
C365	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C366,367	0160-4835	CAPACITOR-FXD .1µF ±10% 50Vdc CER
C371	0160-4833	CAPACITOR-FXD 0.22µF ±10% 100Vdc CER
C372	0160-4787	CAPACITOR-FXD 22pF ±5% 100Vdc CER 0±30
C373	0180-0376	CAPACITOR-FXD .47µF ±10% 35Vdc TA
C374	0160-4791	CAPACITOR-FXD 10pF ±5% 100Vdc CER 0 ±30
C375	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C376	0160-4835	CAPACITOR-FXD .lµF ±10% 50Vdc CER
C377,378	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C379	0160-4835	CAPACITOR-FXD .1µF ±10% 50Vdc CER
C380,381	0160-4833	CAPACITOR-FXD .022µF ±10% 100Vdc CER
C382	0160-4829	CAPACITOR-FXD 680pF ±10% 100Vdc CER
C383	0160-4820	CAPACITOR-FXD 1800pF ±5% 100Vdc CER
C384	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C385	0180-0405	CAPACITOR-FXD 1.8µF ±10% 20Vdc TA
C387-389	0160-4835	CAPACITOR-FXD .1µF ±10% 50Vdc CER
C391	0160-8153	CAPACITOR-FXD 4700pF 250Vdc

Table 3-3. Agilent 60501B/60502B Control Board - Electrical Parts (continued)

Reference Designation	Agilent Part Number	Description
D302-304	1901-0033	DIODE-GEN PURP 180V 200mA lN645
D306,308	1901-0033	DIODE-GEN PURP 180V 200mA lN645
D310-313	1901-0033	DIODE-GEN PURP 180V 200mA lN645
D314-317	1901-0731	DIODE-PWR RECT 400V lA
D321	1901-0880	DIODE-GEN PURP 200mA DO-35
F300	2110-0716	FUSE-SUBMINIATURE .5A 125V
F301,302	2110-0821	FUSE (METRIC) .315A 250V
J1-3	1252-2789	CONNECTOR-POST RT ANGLE 12-CONTACT
Pl-3	60502-80005	CABLE ASSEMBLY W/PLUG 12-CONTACT
P4	60502-80007	CABLE ASSEMBLY W/PLUG 26-CONTACT
Q301	1858-0054	TRANSISTOR ARRAY 16-PIN DIP
R305	0698-4443	RESISTOR 4.53K 1% .125W TF TC=0±100
R306	0698-6320	RESISTOR 5K .1% .125W TF TC=0±25
R307	0698-0085	RESISTOR 2.61K 1% .125W TF TC=0±100
R308	0757-0462	RESISTOR 75K 1% .125W TF TC=0±100
R309	0698-6320	RESISTOR 5K .1% .125W TF TC=0±25
R310,311	0698-8827	RESISTOR 1M 1% .125W TF TC=0±100
R314	0757-0465	RESISTOR 100K 1% .125W TF TC=0±100
R315	0698-0085	RESISTOR 2.61K 1% .125W TF TC=0±100
R316	0699-0924	RESISTOR 11K .1% .125W TF TC=0±25
R317,318	0757-0438	RESISTOR 5.11K 1% .125W TF TC=0±100
R319,320	0698-6360	RESISTOR 10K .1% .125W TF TC=0±25
R321,322	0757-0438	RESISTOR 5.11K 1% .125W TF TC=0+100
R323,324	0698-6360	RESISTOR 10K .1% .125W TF TC=0±25
R325-327	0757-0438	RESISTOR 5.11K 1% .125W TF TC=0±100
R329	0757-0416	RESISTOR 511 1% .125W TF TC=0±100
R330,331	0757-0472	RESISTOR 200K 1% .125W TF TC=0±100
R332	0757-0280	RESISTOR 1K 1% .125W TF TC=0±100
R333	1810-0368	RESISTOR-NET 6-PIN SIP 10.0K X 5
R337	0757-0280	RESISTOR 1K 1% .125W TF TC=0±100
R338	0699-0924	RESISTOR 11K .1% .125W TF TC=0±25
R339,340	0698-6360	RESISTOR 10K .1% .125W TF TC=0±25
R341	0757-0438	RESISTOR 5.11K 1% .125W TF TC=0±100
R342	0757-0449	RESISTOR 20K 1% .125W TF TC=0±100
R343	0698-4443	RESISTOR 4.53K 1% .125W TF TC=0±100
R344	0757-0439	RESISTOR 6.81K 1% .125W TF TC=0±100
R345	0699-0924	RESISTOR 11K .1% .125W TF TC=0±25
R346	0698-6533	RESISTOR 12.5K .1% .125W TF TC=0±25
R347	0757-0438	RESISTOR 5.11K 1% .125W TF TC=0±100
R348	0698-3215	RESISTOR 499K 1% .125W TF TC=0±100
R354	0699-1797	RESISTOR 10M 5%
R355	1810-0280	RESISTOR-NET 10-PIN SIP 10.0K X 9
R356,357	0698-3633	RESISTOR 390 5% 2W MO TC=0±200
R358	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100

Table 3-3. Agilent 60501B/60502B Control Board - Electrical Parts (continued)

Reference Designation	Agilent Part Number	Description
R359-361	0757-0424	RESISTOR l.1K 1% .125W TF TC=0±100
R365	0757-0440	RESISTOR 7.5K 1% .125W TF TC=0±100
R368,369	0699-1728	RESISTOR 2.652K .1% .125W TF TC=0±25
R370,371	0698-8672	RESISTOR 243.4 .1% .125W TF TC=0±25
R372	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100
R375	0757-0280	RESISTOR lK 1% .125W TF TC=0±100
R379	0698-0084	RESISTOR 2.15K 1% .125W TF TC=0±100
R380	0757-0449	RESISTOR 20K 1% .125W TF TC=0±100
R381	0698-4503	RESISTOR 66.5K 1% .125W TF TC=0±l00
R382	0698-4486	RESISTOR 24.9K 1% .125W TF TC=0±100
R383	0757-0465	RESISTOR 100K 1% .125W TF TC=0±100
R384	0699-1254	RESISTOR 536K 1% .125W TF TC=0±100
R385	0698-3382	RESISTOR 5.49K 1% .125W TF TC=0±100
R386	0757-0465	RESISTOR 100K 1% .125W TF TC=0±100
R387,388	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100
R389	0757-0436	RESISTOR 4.32K 1% .125W TF TC=0±100
R390	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100
R391	0757-0437	RESISTOR 4.75K 1% .125W TF TC=0±100
R392	0757-0465	RESISTOR 100K 1% .125W TF TC=0±100
R393	0757-0280	RESISTOR 1K 1% .125W TF TC=0±100
R394	0757-0472	RESISTOR 200K 1% .125W TF TC=0±100
R395	0698-8827	RESISTOR 1M 1% .125W TF TC=0±100
R396	0757-0438	RESISTOR 5.11K 1% .125W TF TC=0±100
R397	0698-0084	RESISTOR 2.15K 1% .125W TF TC=0±100
R398	0757-0420	RESISTOR 750 1% .125W TF TC=0±100
R399	0757-0458	RESISTOR 51.1K 1% .125W TF TC=0±100
R400	0757-0455	RESISTOR 36.5K 1% .125W TF TC=0±100
R401	0757-0278	RESISTOR 1.78K 1% .125W TF TC=0±100
R406	0764-0041	RESISTOR 30 5% 2W MO TC=0±200
R413,414	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100
R415	0757-0455	RESISTOR 36.5K 1% .125W TF TC=0±100
R416	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100
R417	0757-0401	RESISTOR 100 1% .125W TF TC=0±100
R418	0698-3430	RESISTOR 21.5 1% .125W TF TC=0±100
R420	1810-0280	RESISTOR-NET 10-PIN SIP 10.0K X 9
R421,422	8159-0005	RESISTOR-ZERO OHMS 22 AWG
R423	0757-0401	RESISTOR 100 1% .125W TF TC=0±100
RTBl	0360-2345	MATING PLUG FOR TB301 (control)
RTP301	1258-0209	REMOVABLE JUMPER 2-POSITION
T301	9100-4840	TRANSFORMER-PWR 100/120/220/240V
TB301	0360-2348	TERMINAL BLOCK 10-TERMINAL
TP301	1251-4926	CONNECTOR-POST TYPE 8-CONTACT
U301	5080-2516	IC PROGRAMMABLE MICROPROCESSOR
U302	1820-3399	IC FF CMOS/74HC D-TYPE POS EDGE-TRIG

Table 3-3. Agilent 60501B/60502B Control Board - Electrical Parts (continued)

Reference Designation	Agilent Part Number	Description
U303	1820-2228	IC QUAD NAND SET/RESET LATCH CMOS
U304	1820-3079	IC 3-TO-8 LINE DECODER CMOS/74HC
U306	1826-1845	IC DUAL OP AMP 8-PIN DIP (PRECISION)
U307	1826-1317	IC DUAL OP AMP 8-PIN DIP (LOW NOISE)
U308	1826-0962	IC DUAL OP AMP 8-PIN DIP
U309	1826-0850	ANALOG SWITCH 16-PIN DIP
U318	1820-2924	IC QUAD NOR GATE CMOS/74HC 2-INPUT
U319	1820-3399	IC FF CMOS/74HC D-TYPE POS-EDGE-TRIG
U320	1826-1488	D/A CONVERTER CMOS 12-BIT 20-PIN
U321	1826-1068	D/A CONVERTER CMOS 8-BIT 20-PIN
U322	1826-1488	D/A CONVERTER CMOS 12-BIT 20-PIN
U323	1826-0962	IC DUAL OP AMP 8-PIN DIP
U324	1826-1845	IC DUAL PRECISION OP AMP 8-PIN DIP
U325	1826-0962	IC DUAL OP AMP 8-PIN DIP
U326	1826-1081	IC PRECISION OP AMP 8-PIN DIP
U327	1826-1370	IC QUAD COMPARATOR 16-PIN DIP
U328	1826-1081	IC PRECISION OP AMP 8-PIN DIP
U329	1826-1369	IC REGULATOR-FXD 9.95/10.05V 8-PIN DIP
U330	1820-3399	IC FF CMOS/74HC D-TYPE POS-EDGE-TRIG
U332-334	1990-0996	IC LED OPTO-ISOLATOR IF=10mA MAX
U335	1826-0393	IC REGULATOR-ADJUSTABLE 1.2/37V POS
U336	1826-0122	IC REGULATOR-FXD 4.8/5.2V
U337	1826-0527	IC REGULATOR-ADJUSTABLE 1.2/37V NEG
U340	1826-0850	ANALOG SWITCH 16-PIN DIP
U341	1820-3297	IC OCTAL BUS DRIVER CMOS/74HC
U342	1818-4932	IC EEPROM NMOS 1024 (lK)
U344	1826-0962	IC DUAL OP AMP 8-PIN DIP
U345	1820-3399	IC FF CMOS/74HC D-TYPE POS-EDGE-TRIG
U346	1826-0850	ANALOG SWITCH 16-PIN DIP
U347	1826-0412	IC DUAL PRECISION COMPARATOR 8-PIN DIP
U348	1826-1343	IC REGULATOR-ADJUSTABLE 2.5/36V 8-PIN DIP
U349	5080-2137	IC PROGRAMMED GAL
U350	1820-6774	IC BIN COUNTER CMOS/74HC POS-EDGE-TRIG
U351	5080-2121	IC DECADE DIVIDER GATE ARRAY
U352	1820-3172	IC FF CMOS/74HC J-K POS-EDGE-TRIG
U353	1820-3081	IC FF CMOS/74HC D-TYPE POS-EDGE-TRIG
U354,355	1820-3082	IC TRANSCEIVER OCTAL BUS
VR301,302	1902-0957	DIODE-ZENER 9.1V 5% PD=.4W
VR303,304	1902-0783	DIODE-ZENER 16.2V 5% PD=1W
W1	7175-0057	RESISTOR-ZERO OHMS SOLID TINNED COPPER
Y301	0410-1944	RESONATOR-QUARTZ 4.0000MHz

Table 3-4. Agilent 60501B/60502B Power Board - Electrical Parts

Reference Designation	Model	Agilent Part Number	Description
	60501B	60501-60023	**POWER BOARD**
	60502B	60502-60025	**POWER BOARD**
Cl-4	60502B	0160-4820	CAPACITOR-FXD 1800pF ±5% 100Vdc CER
C5-8	BOTH	0160-4820	CAPACITOR-FXD 1800pF ±5% 100Vdc CER
C11,12	60502B	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C13,14	BOTH	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C15,16	60502B	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C17-21	BOTH	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C25	BOTH	0160-7024	CAPACITOR-FXD 2.2µF ±10% 100Vac CER
C26	BOTH	0160-4831	CAPACITOR-FXD 4700pF ±10% 100Vdc CER
C32,33	BOTH	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C34	BOTH	0160-4048	CAPACITOR-FXD .022µF ±20% 250Vac
C35	BOTH	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C36	BOTH	0160-5469	CAPACITOR-FXD lµF ±10% 50Vdc METAL-PE
C38-42	BOTH	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C49-52	60502B	0160-4822	CAPACITOR-FXD 1000pF ±5% 100Vdc CER
C53-56	60501B	0160-4810	CAPACITOR-FXD 330pF ±5% 100Vdc CER
C53-56	60502B	0160-4822	CAPACITOR-FXD 1000pF ±5% 100Vdc CER
C60	BOTH	0160-4833	CAPACITOR-FXD .022µF ±10% 100Vdc CER
C106	BOTH	0160-4833	CAPACITOR-FXD .022µF ±10% 100Vdc CER
C125	60501B	0160-5166	CAPACITOR-FXD .015µF ±20% 50Vdc CER
C125	60502B	0160-4833	CAPACITOR-FXD .022µF ±10% 100Vdc CER
C126	BOTH	0160-5098	CAPACITOR-FXD .22µF ±10% 50Vdc CER
C127	BOTH	0160-4835	CAPACITOR-FXD .lµF ±10% 50Vdc CER
C128	BOTH	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C129	BOTH	0160-4833	CAPACITOR-FXD .022uF ±10% 100Vdc CER
C130,131	BOTH	0160-4834	CAPACITOR-FXD .047µF ±10% 100Vdc CER
C132,133	BOTH	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C134	BOTH	0160-4801	CAPACITOR-FXD 100pF ±5% 100Vdc CER 0±30
C135	BOTH	0160-4830	CAPACITOR-FXD 2200pF ±10% 100Vdc CER
C136	BOTH	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C137	BOTH	0160-4832	CAPACITOR-FXD .01µF ±10% 100Vdc CER
C138	BOTH	0160-4814	CAPACITOR-FXD 150pF ±5% 100Vdc CER 0±30
C139	BOTH	0160-4832	CAPACITOR-FXD .01µF ±10% 100Vdc CER
C140,141	BOTH	0160-4835	CAPACITOR-FXD .lµF ±10% 50Vdc CER
C142	BOTH	0160-4833	CAPACITOR-FXD .022µF ±10% 100Vdc CER
C143	BOTH	0160-4812	CAPACITOR-FXD 220pF ±5% 100Vdc CER 0±30
C144-147	60502B	0160-4787	CAPACITOR-FXD 22pF ±5% 100Vdc CER
C148-150	BOTH	0160-4787	CAPACITOR-FXD 22pF ±5% 100Vdc CER
C151	60501B	0160-4807	CAPACITOR-FXD 33pF ±5% 100Vdc CER
C151	60502B	0160-4805	CAPACITOR-FXD 47pF ±5% 100Vdc CER

Table 3-4. Agilent 60501B/60502B Power Board - Electrical Parts (continued)

Reference Designation	Model	Agilent Part Number	Description
C152	BOTH	0160-4831	CAPACITOR-FXD 4700pF ±10% 100Vdc CER
C154	BOTH	0160-4832	CAPACITOR-FXD .01µF ±10% 100Vdc CER
C155	BOTH	0160-5422	CAPACITOR-FXD .047µF ±20% 50Vdc CER
C156	BOTH	0160-4821	CAPACITOR-FXD 1200pF ±5% 100Vdc CER
C157	BOTH	0160-4183	CAPACITOR-FXD 1000pF ±20% 250Vdc CER
D10,11	BOTH	1901-0033	DIODE-GEN PURP 180V 200mA lN645
D17,18	BOTH	1901-0033	DIODE-GEN PURP 180V 200mA lN645
D19-22	60502B	1901-0033	DIODE-GEN PURP 180V 200mA lN645
D23-28	BOTH	1901-0033	DIODE-GEN PURP 180V 200mA lN645
D33	BOTH	1901-0880	DIODE-GEN PURP 200mA DO-35
D35	BOTH	1901-0033	DIODE-GEN PURP 180V 200mA lN645
D53-55	BOTH	1901-0033	DIODE-GEN PURP 180V 200mA lN645
D56	BOTH	1901-0731	DIODE-PWR RECT 400V 1A
D57,58	BOTH	1901-0880	DIODE-GEN PURP 200mA DO-35
D59			NOT USED
D60	BOTH	1901-0033	DIODE-GEN PURP 180V 200mA 1N645
D62	BOTH	1901-0880	DIODE-GEN PURP 200mA DO-35
D63			NOT USED
Fl-4	60502B	2110-0757	FUSE-SUBMINIATURE .062A 125V
F5-8	BOTH	2110-0757	FUSE-SUBMINIATURE .062A 125V
F9-12	60502B	2110-0697	FUSE-SUBMINIATURE 15A 32V
F13-16	BOTH	2110-0697	FUSE-SUBMINIATURE 15A 32V
J2	BOTH	1251-4670	CONNECTOR-POST RT ANGLE 9-CONTACT
J4	BOTH	1251-7743	CONNECTOR-POST 26-CONTACT
Q1	60502B	1858-0137	FET SUBASSEMBLY (includes 4 FETS)
Q2	BOTH	1858-0137	FET SUBASSEMBLY (includes 4 FETS)
Q9	BOTH	1855-0386	TRANSISTOR J-FET 2N4392 N-CHANNEL
Q10	BOTH	1854-0635	TRANSISTOR NPN SI PD=50W FT=20MHz
Q11	BOTH	1853-0281	TRANSISTOR PNP SI 2N2907A PD=400mW
Q12	BOTH	1858-0054	TRANSISTOR ARRAY 16-PIN DIP
Rl-4	60502B	06060-80014	RESISTOR .050 3W
R5-8	BOTH	06060-80014	RESISTOR .050 3W
R9-12	60502B	0698-3430	RESISTOR 21.5 1% .125W TF TC=0±100
R13-16	BOTH	0698-3430	RESISTOR 21.5 1% .125W TF TC=0±100
R17-20	60502B	0698-3156	RESISTOR 14.7K 1% .125W TF TC=0±100
R21-24	BOTH	0698-3156	RESISTOR 14.7K 1% .125W TF TC=0±100
R25,26	60502B	0698-3162	RESISTOR 46.4K 1% .125W TF TC=7±100
R27	60502B	0757-0457	RESISTOR 47.5K 1% .125W TF TC=0±100
R28	60502B	0698-3162	RESISTOR 46.4K 1% .125W TF TC=7±100
R29-32	BOTH	0757-0458	RESISTOR 51.1K 1% .125W TF TC=0±100
R33-36	60502B	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100

Table 3-4. Agilent 60501B/60502B Power Board - Electrical Parts (continued)

Reference Designation	Model	Agilent Part Number	Description
R37-40	BOTH	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100
R41	60501B	1810-1273	RESISTOR-NET 10-PIN SIP 10K X .4; 20K X 1
R41	60502B	1810-1260	RESISTOR-NET 10-PIN SIP 20K X 9
R43	BOTH	1810-0316	RESISTOR-NET 16-PIN DIP 10K X 8
R44	BOTH	0698-0085	RESISTOR 2.61K 1% .125W TF TC=0±100
R46	BOTH	0757-0438	RESISTOR 5.11K 1% .125W TF TC=0±100
R50	BOTH	0757-0458	RESISTOR 51.1K 1% .125W TF TC=0±100
R53,54	BOTH	0698-6629	RESISTOR 60K .1% .125W TF TC=0±25
R55,56	BOTH	0698-6360	RESISTOR 10K .1% .125W TF TC=0±25
R58	BOTH	0698-5089	RESISTOR 33K 1% .125W TF TC=0±100
R59	BOTH	0757-0457	RESISTOR 47.5K 1% .125W TF TC=0±100
R60	BOTH	0698-4457	RESISTOR 576 1% .125W TF TC=0±100
R64	BOTH	0757-0455	RESISTOR 36.5K 1% .125W TF TC=0±100
R65	BOTH	0757-0438	RESISTOR 5.11K 1% .125W TF TC=0±100
R66	BOTH	0698-0084	RESISTOR 2.15K 1% .125W TF TC=0±100
R67	BOTH	0757-0427	RESISTOR 1.5K % .125W TF TC=0±100
R68	BOTH	0698-6630	RESISTOR 20K .1% .125W TF TC=0±25
R69	BOTH	0699-0620	RESISTOR 2.222K .1% .125W TF TC=0±25
R71	BOTH	0699-0486	RESISTOR 2K .1% .125W TF TC=0±25
R88	BOTH	0811-3574	RESISTOR 3.9 1% 5W PWR TC=0±920
R90	BOTH	0698-6360	RESISTOR 10K .1% .125W TF TC=0±25
R91	BOTH	8159-0005	RESISTOR-ZERO OHMS 22 AWG
R92,93	BOTH	0698-0083	RESISTOR 1.96K 1% .125W TF TC=0±100
R94	BOTH	0757-0449	RESISTOR 20K 1% .125W TF TC=0±100
R95	BOTH	0757-0280	RESISTOR 1K 1% .125W TF TC=0±100
R96	BOTH	0698-6629	RESISTOR 60K .1% .125W TF TC=0±25
R101	60502B	1810-1261	RESISTOR-NET 16-PIN DIP MULTI-VALUE
R102,103	BOTH	1810-1261	RESISTOR-NET 16-PIN DIP MULTI-VALUE
R104	60502B	1810-1261	RESISTOR-NET 16-PIN DIP MULTI-VALUE
R105	BOTH	0698-6360	RESISTOR 10K .1% .125W TF TC=0±25
R106	BOTH	0698-3572	RESISTOR 60.4K 1% .125W TF TC=0±100
R107	BOTH	0698-3359	RESISTOR 12.7K 1% .125W TF TC=0±100
R108	BOTH	0757-0438	RESISTOR 5.11K 1% .125W TF TC=0±100
R109	BOTH	0757-0449	RESISTOR 20K 1% .125W TF TC=0±100
R110	BOTH	0698-3160	RESISTOR 31.6K 1% .125W TF TC=0±100
R114	BOTH	0757-0447	RESISTOR 16.2K 1% .125W TF TC=0±100
R115	BOTH	0757-0416	RESISTOR 511 1% .125W TF TC=0±100
R116	BOTH	0757-0472	RESISTOR 200K 1% .125W TF TC=0±100
R117	BOTH	0698-6360	RESISTOR 10K .1% .125W TF TC=0±25
R136	BOTH	0757-0449	RESISTOR 20K 1% .125W TF TC=0±100
R142	BOTH	1810-1274	RESISTOR-NET 10-PIN SIP MULTI-VALUE

Table 3-4. Agilent 60501B/60502B Power Board - Electrical Parts (continued)

Reference Designation	Model	Agilent Part Number	Description
R143	BOTH	0757-0427	RESISTOR 1.5K 1% .125W TF TC=0±100
R144	BOTH	0698-4479	RESISTOR 14K 1% .125W TF TC=0±100
R151	BOTH	0698-3160	RESISTOR 31.6K 1% .125W TF TC=0±100
R201	BOTH	0757-0441	RESISTOR 8.25K 1% .125W TF TC=0±100
R202	BOTH	0698-0283	RESISTOR 2K 1% .125W TF TC=0±100
R204	BOTH	0757-0472	RESISTOR 200K 1% .125W TF TC=0±100
R205	BOTH	0757-0439	RESISTOR 6.81K 1% .125W TF TC=0±100
R206	BOTH	0757-0412	RESISTOR 365 1% .125W TF TC=0±100
R207	BOTH	0757-0472	RESISTOR 200K 1% .125W TF TC=0±100
R208	BOTH	0757-0438	RESISTOR 5.11K 1% .125W TF TC=0±100
R209	BOTH	0683-0475	RESISTOR 4.7 5% .25W CF TC=0-400
R211	BOTH	0757-0278	RESISTOR 1.78K 1% .125W TF TC=0±100
R212	BOTH	0757-0439	RESISTOR 6.81K 1% .125W TF TC=0±100
R213,214	BOTH	0698-3450	RESISTOR 42.2K 1% .125W TF TC=0±100
R215	BOTH	0757-0462	RESISTOR 75K 1% .125W TF TC=0±100
R216	BOTH	0757-0278	RESISTOR 1.78K 1% .125W TF TC=0±100
R217-220	60502B	0757-0465	RESISTOR 100K 1% .125W TF TC=0±100
R221-224	BOTH	0757-0465	RESISTOR 100K 1% .125W TF TC=0±100
R225	BOTH	0698-8827	RESISTOR 1M 1% .125W TF TC=0±100
R226	BOTH	2100-3750	RESISTOR-TRIMMER 20K 10%
R228	BOTH	0812-3574	RESISTOR 3.9 1% 5W PWR TC=0±20
R229,230	BOTH	0683-0475	RESISTOR 4.7 5% .25W CF TC=0-400
R231	BOTH	0683-1065	RESISTOR 10M 5% .25W CC TC=-900/+1100
R233	BOTH	1810-0368	RESISTOR-NET 6-PIN SIP 10K X 5
R234	BOTH	0757-0279	RESISTOR 3.16K 1% .125W TF TC=0±100
R235	BOTH	0757-0439	RESISTOR 6.81K 1% .125W TF TC=0±100
R238	BOTH	0757-0280	RESISTOR 1K 1% .125W TF TC=0±100
R239	BOTH	0757-0405	RESISTOR 162 1% .125W TF TC=0±100
R249	BOTH	8159-0005	RESISTOR-ZERO OHMS 22 AWG
R252	BOTH	8159-0005	RESISTOR-ZERO OHMS 22 AWG
R255,256	BOTH	0757-0463	RESISTOR 82.5K 1% .125W TF TC=0±100
R257,259	BOTH	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100
R261	BOTH	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100
R262	BOTH	0698-3226	RESISTOR 6.49K 1% .125W TF TC=0±100
R263	BOTH	0757-0444	RESISTOR 12.1K 1% .125W TF TC=0±100
R264-266	BOTH	8159-0005	RESISTOR-ZERO OHMS 22 AWG
R267	BOTH	1810-1490	RESISTOR-NET 12-PIN DIP MULTI-VALUE
R268	BOTH	1810-1489	RESISTOR-NET 8-PIN SIP MULTI-VALUE
R269	BOTH	0757-0442	RESISTOR 10K 1% .125W TF TC=0±100
R270	BOTH	0757-0436	RESISTOR 4.32K 1% .125W TF TC=0±100
R271	BOTH	0757-0443	RESISTOR 11K 1% .125W TF TC=0±100

Table 3-4. Agilent 60501B/60502B Power Board - Electrical Parts (continued)

Reference Designation	Model	Agilent Part Number	Description
R272	BOTH	0757-0463	RESISTOR 82.5K 1% .125W TF TC=0±100
R274	BOTH	0757-0274	RESISTOR 1.21K 1% .125W TF TC=0±100
R275-278	60502B	0698-8827	RESISTOR 1M 1% .125W TF TC=0±100
R279-282	BOTH	0698-8827	RESISTOR 1M 1% .125W TF TC=0±100
R283	BOTH	0698-8913	RESISTOR 1.5M 1% .125W TF TC=0±100
R284	BOTH	0698-0064	RESISTOR 9.31K 1% .125W TF TC=0±100
R285	BOTH	0757-0464	RESISTOR 90.9K 1% .125W TF TC=0±100
R288	BOTH	0698-8913	RESISTOR 1.5M 1% .125W TF TC=0±100
R289	BOTH	0698-4536	RESISTOR 340K 1% .125W TF TC=0±100
R290	BOTH	0757-0459	RESISTOR 56.2K 1% .125W TF TC=0±100
RT2	BOTH	0837-0397	THERMISTOR 10K (under large heatsink)
S1	BOTH	3101-2894	SENSE SWITCH DPDT
	BOTH	0370-2862	PUSHBUTTON (for sense switch)
U1	60502B	1826-2252	IC DUAL OP AMP 8-PIN DIP LOW NOISE
U2,3	60502B	1826-1533	IC DUAL OP AMP 8-PIN DIP H-SLEW RATE
U4	60502B	1826-2252	IC DUAL OP AMP 8-PIN DIP LOW NOISE
U5	BOTH	1826-1533	IC DUAL OP AMP 8-PIN DIP H-SLEW RATE
U6	BOTH	1826-2252	IC DUAL OP AMP 8-PIN DIP LOW NOISE
U7	BOTH	1826-1533	IC DUAL OP AMP 8-PIN DIP H-SLEW RATE
U8	BOTH	1826-2252	IC DUAL OP AMP 8-PIN DIP LOW NOISE
U9	BOTH	1826-0850	IC ANALOG SWITCH 16-PIN DIP
U10	BOTH	1826-0138	IC QUAD COMPARATOR 14-PIN DIP
U11	BOTH	1826-1370	IC QUAD COMPARATOR 16-PIN DIP
U12	BOTH	1826-1533	IC DUAL OP AMP 8-PIN DIP H-SLEW RATE
U13	BOTH	1826-0962	IC DUAL OP AMP 8-PIN DIP LOW BIAS H-IMPD
U14	BOTH	1826-1543	IC DUAL OP AMP 8-PIN DIP HS
U15	BOTH	1826-2252	IC DUAL OP AMP 8-PIN DIP LOW NOISE
U16	BOTH	1826-0962	IC DUAL OP AMP 8-PIN DIP LOW BIAS H-IMPD
U17	BOTH	1826-0346	IC DUAL OP AMP 8-PIN DIP GP
VR10	BOTH	1902-0783	ZENER DIODE 16V 5% PD=1W
VR26	BOTH	1902-0957	ZENER DIODE 9.1V 5% PD=.4W
VR27	BOTH	1902-0761	ZENER DIODE lN821 6.2V 5% PD=.4W
VR28	BOTH	1901-1284	VOLTAGE SUPPRESSOR 75V
VR29			NOT USED

Table 3-5. Agilent 60501B/60502B Mechanical Parts

Agilent Part Number	Quantity	Description
		CONTROL BOARD
60502-00001	1	MODULE CHASSIS
7121-0850	1	WARNING LABEL
7121-2794	1	SERIAL# LABEL
0515-0413	2	SCREW-MACH M5X0.8X6mm (rear panel to module chassis)
0515-0414	6	SCREW-MACH M4X0.7X10mm (control board to module chassis)
60502-80004	2	SPACER-PLASTIC (align heatsink with module chassis)
1205-0730	2	HEATSINK (U335,337)
0515-0104	2	SCREW-MACH M3X0.5 (U335,337)
0535-0031	2	NUT-HEX W/LOCKWASHER M3 (U335,337)
3050-0891	2	WASHER M3 (U335,337)
2110-0689	4	FUSE CLIP (F301,302)
		POWER BOARD
60502-20001	1	LARGE HEATSINK (for Q1,Q2)
1205-0743	2	THERMAL PAD (between Q1,Q2 and heatsink)
0340-1217	1	INSULATOR (in heatsink for RT2)
60502-00002	1	REAR PANEL
60501-80002	1	REAR PANEL LABEL(60501B)
60502-80009	1	REAR PANEL LABEL(60502B)
1510-0134	2	BINDING POST ASSEMBLY
3050-1320	2	SPRING STEEL WASHER (on binding post)
2190-0629	2	LOCKWASHER (on binding post)
0535-0020	2	NUT-HEX (on binding post)
0515-0155	2	SCREW-MACH M5X0.8X12mm (binding post to bus bar)
0515-1146	1	SCREW-MACH M3X0.5X6mm (ground wire to chassis)
3050-0891	1	WASHER M3 (ground to chassis)
60502-00003	1	BUS BAR (- input)
60502-00004	1	BUS BAR (+ input)
0515-1584	2	SCREW MACH M5X0.8X8mm (bus bar to power board)
0515-0414	14	SCREW MACH M4X0.7X10mm(power board to chassis and large heatsink; Q1,Q2 to large heatsink; and bus bar to large heatsink)
4040-2268	1	SAFETY COVER (rear panel terminal block)
		MISCELLANEOUS
9222-1375	1	BAG, STATIC PROTECTION
60502-80002	1	FLOATER, ANTI-STATIC
60502-80003	1	FLOATER, ANTI-STATIC
9211-6196	1	CARTON, SHIPPING
60501-90009	1	MANUAL, OPERATING (60501B)
60502-90009	1	MANUAL, OPERATING (60502B)
5951-2830	1	MANUAL, SERVICE

4

Diagrams

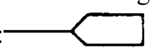
Schematic Diagrams

Schematic diagrams and component location diagrams are provided for the Control board as well as the Power board on two foldout pages. Two schematic diagrams of the Power board are included in Figure 4-2 on the first foldout; three schematic diagrams of the Control board are included in Figure 4-4 on the second foldout. Table 4-1 lists the notes that apply to both the Control board and Power board schematic diagrams.

Table 4-2 lists, alphabetically, all of the signal names that appear on the schematic, along with a brief description of the signal's function. To help you locate where signals come from and go to, Table 4-1 lists the coordinates for each appearance of a signal on each sheet of the schematic. Coordinates printed in **BOLD** indicate the signal origin. On the Control board for example, when ACLR* is active, it clears the analog circuits. ACLR* originates in area 4D of sheet 1 and also appears in area 2B of sheet 3.

Table 4-1. Schematic Diagram Notes

1. All resistors are in ohms ± 1%, 1/8 W unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All unmarked capacitors are 0.047µF.
4. An asterisk negates a signal name. For example, $\overline{CS2}$ appears on the schematic as CS2*.
5. Signal lines that are terminated by flags continue on other sheets, and may also go to other locations on the same sheet. Table 4-2 documents all signal terminations on the schematics. Note that flags do not indicate signal flow direction.

   Example:  CC_PROG
6. Unterminated signal lines go to at least one other location of the same schematic sheet.

Example: SPCLR*

7. Heavy signal lines represent multiple-wire data buses.
8. Unless otherwise noted, bias connections to IC packages are as follows:

	Common	**+5V**
14-pin packages	pin 7	pin 14
16-pin packages	pin 8	pin 16
20-pin packages	pin 10	pin 20

9. Values in brackets [ ] apply to model 60501B.

Component Location Diagrams

Each foldout includes a component locations diagram with a look-up table for locating electrical components. Figure 4-1 gives the component locations for the Control board and Figure 4-3 gives the component locations for the Power board. The coordinates in the look-up table under each diagram reference the grid on the diagram and give the location of some point on each component to within 1/10 of a unit. The mainframe Service Manual gives several examples of how to use the table.

The component locations diagram also indicates specific troubleshooting test point locations. The test points are described in Chapter 3 of the mainframe Service Manual and are used in various troubleshooting procedures described in that chapter.

Table 4-2. Signal-Name Descriptions

Mnemonic	Function	Sheet 1	Sheet 2	Sheet 3
	CONTROL BOARD			
ACLR*	Analog circuits clear (D)	**4D**		2B
BO*	Brown out input disable (D)	3D		2A
CC_EN*	CC mode enable (D)	**6D**, 3B		
CC_PROG	Programming voltage for CC mode (A)	**3B**	2B	
CCVTST	Comparator output, main DAC self-test (D)	6D	**4A**	
CG*	CR-mode middle-and-high-range select (D)	**5D**	4D	
CLR	Initialize transient generator (D)	**7B**, 5A		
CR*	CR-mode low-range select (D)	**5D**	3C	2A
CS0*	Main DAC chip select (D)	**1D**	8D	
CS1*	Transient DAC chip select (D)	**1D**	7C	
CS2*	Slew range chip select (D)	**1D**, 8C		
CS3*	Readback DAC chip select (D)	**1D**	8B	
CS4*	Secondary-data-bus buffer chip select (D)	**1D**	8D	
CS5*	Control-signals latch chip select (D)	**1D**, 6D		
CS6*	Control-signals latch chip select (D)	**7D**, 5D		
CS7*	Non-volatile memory R/W chip select (D)	**8D** 3C, 2C		
CV_EN*	CV mode enable (D)	**6D**, 3C		
CV_PROG	Programming voltage for CV mode (A)	**3C**		2C
DAC_REF*	Main DAC reference enable, CV/CC modes (D)	**5D**	3D	
E	Secondary-µP clock (D)	6D, 8A		
EEPON*	EEPROM power-on disable (D)	2C		**2D**
EPC_EN*	Extended power capability enable/disable (D)	**4D**		2A
EXT_PROG	Ext programming input (A) from rear-panel A4			**1B**, 3C
FLT	Voltage-fault signal (D) to rear-panel A6	**3D**	1B	
FSEL0,FSEL1,FSEL2	Transient-generator frequency-select bits (D)	**5D**, 4A		
HIGH*	Transient-DAC output enable (D)	**6B**	8C	
H/L*	Main-DAC transfer control (D)	**7D**	8D	
H/L-A/D	Readback-DAC transfer control (D)	**7D**	8B	
IMON	Current-monitor output (A) to rear-panel A1		**1D,** 1C	
IMON*	Input-current monitor signal (A)		3D, 6A	2C
	CR-mode low-range DAC reference (A)		4C	
IMONR	Current-monitor-comparator output (D)	6D	**4A**	
LCLR*	Clear status latch (D)	**5D**, 3D		
MODULE_INSTALLED*	Indicate how many modules are installed (D)			**8B**
OP*	Overpower status (D)	3D		2A
OV*	Overvoltage status (D)	3D		2A
PCLR1*	Power-on clear signal from mainframe (D)			**8B**
PORT	PORT output (D) to rear-panel A7	**3D**	1B	
PRX	Primary-µP receiver (D)			8A
PTX	Primary-µP transmitter (D)			8A
P_TRIG	Continuous mode pulse trigger (D)	6A, 5D		
PRI_TRIG	Trigger signal from mainframe (D)			**8B**
PULSE_EN	Pulse-mode enable (D)	**4D**, 6B		
RCK_HI*	Loads transient-level counter (D)	**1D**, 6A		
RCK_LOW*	Loads main-level counter (D)	**1D**, 6A		
RNG	CC-mode range select (D)	**7C**		2B

(A) = analog signal (D) = digital signal **8C** = signal origin

Table 4-2. Signal-Name Descriptions

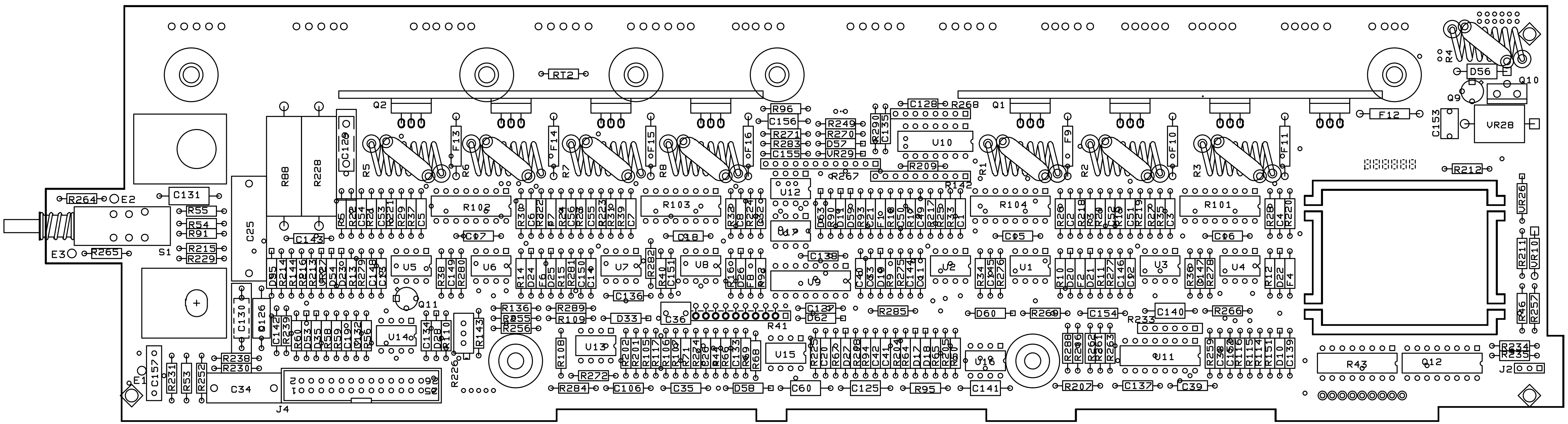
Mnemonic	Function	Sheet 1	Sheet 2	Sheet 3
	CONTROL BOARD			
+ S	Remote + sense (A) from rear-panel + S		**1C**	2C
- S	Remote - sense (A) from rear-panel - S		**1C**	2C
SA_EN*	Secondary µP SA enable (D) from TP301-1	**1C,** 7D		
SD	Secondary µP data bus (D)			
SDB	Secondary µP data bus, buffered (D)			
SKP	Skip self-test (D) from TP301-5	**1B,** 6D		
SLEW	Programming-voltage input to slew circuit (A)	**5B**	**4C**, 5A	
SLW1,SLW2,SLW3,SLW4	Slew-rate control signals (D)	**8C**,**8B**, **8C**,7C, 5C		
SPCLR*	Secondary-circuit power-on clear (D)	lB,7D,6D, 5D	8D	**2D**,2A
SPROG	(not used)		2D	2C
SRX	Secondary-µP receiver (D)	**8D**		**5B**
START	Secondary-µP SA start signal (D)	**1B**		
STAT_EN	Enable status latch (D)	**4D**, 3D		
STB*	Enable chip-select decoder (D)	**7C**, 2D		
STOP	Secondary-µP SA stop signal (D)	**1B**		
STX	Secondary-µP transmitter (D)	**8D**, 1B		5A
S0, S1, S2	Chip-select-decoder input (D)	**7C**, 2D		
TEMP1	Power-board temperature (A)		5A	2C
TMONR	Temperature-monitor-comparator output (D)	6D	**4A**	
TOGGLE*	Toggle mode select (D)	6B	4A	
TRANS_EN	Transient-generator clear and enable (D)	**4D**, 8B, 7B		
	Secondary-µP SA start/stop (D)	**4D**, 1B		
TRIG	Trigger (D)	6A	8C	**5B**
TRIG_EN*	Main and transient DACs trigger enable (D)	**4D**	8D	
UNREG*	Unregulated-input status (D)	3D		2A
UXFER	Main and transient DACs transfer control (D)	**7C**	8D	
VMON	Voltage-monitor output (A) to rear-panel A2		**1C**, 1C	
VMON*	Input-voltage monitor signal (A) to rear panel A2 CR-mode middle-&-high-range DAC Ref (A)		**3C**, 6A 5D	
VMONR	Voltage-monitor-comparator output (D)	6D	**4A**	
VREF	Voltage reference for DACs (A)		**6D**, 8B, 5C	
X	(not used)	3D		2A
-10V_REF	DAC reference for CV and CC modes (A)		**2B**, 4D, 6A	
+15V	To power board (A)			**5D**, 2B
-15V	To power board (A)			**5C**, 2B
+ 12V_REF	Ref for readback DAC & main DAC self-test (A)		**1A**, 5B, 7B, **5D**, 2B	2B

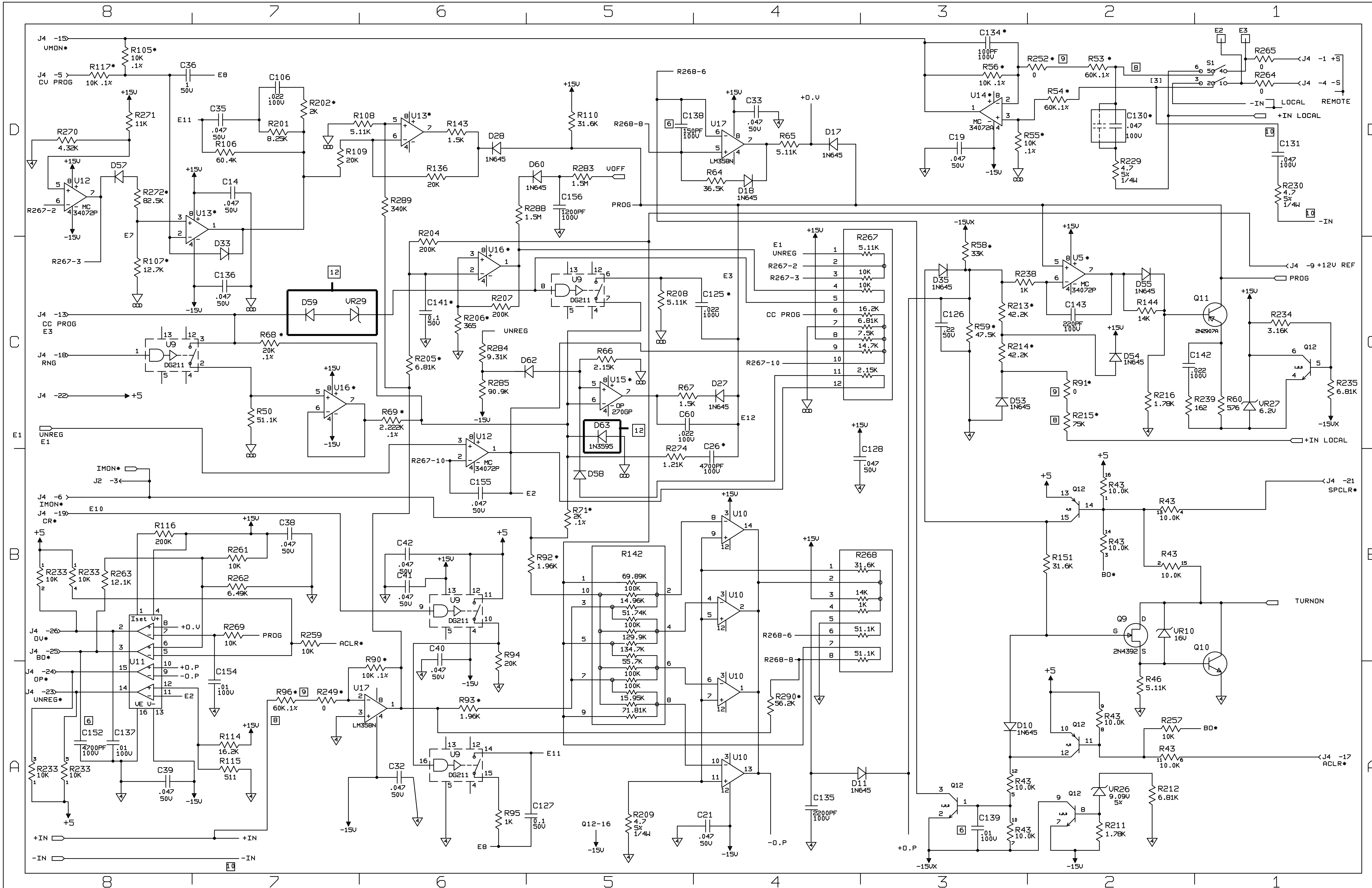
(A) = analog signal (D) = digital signal **8C** = signal origin

Table 4-2. Signal-Name Descriptions

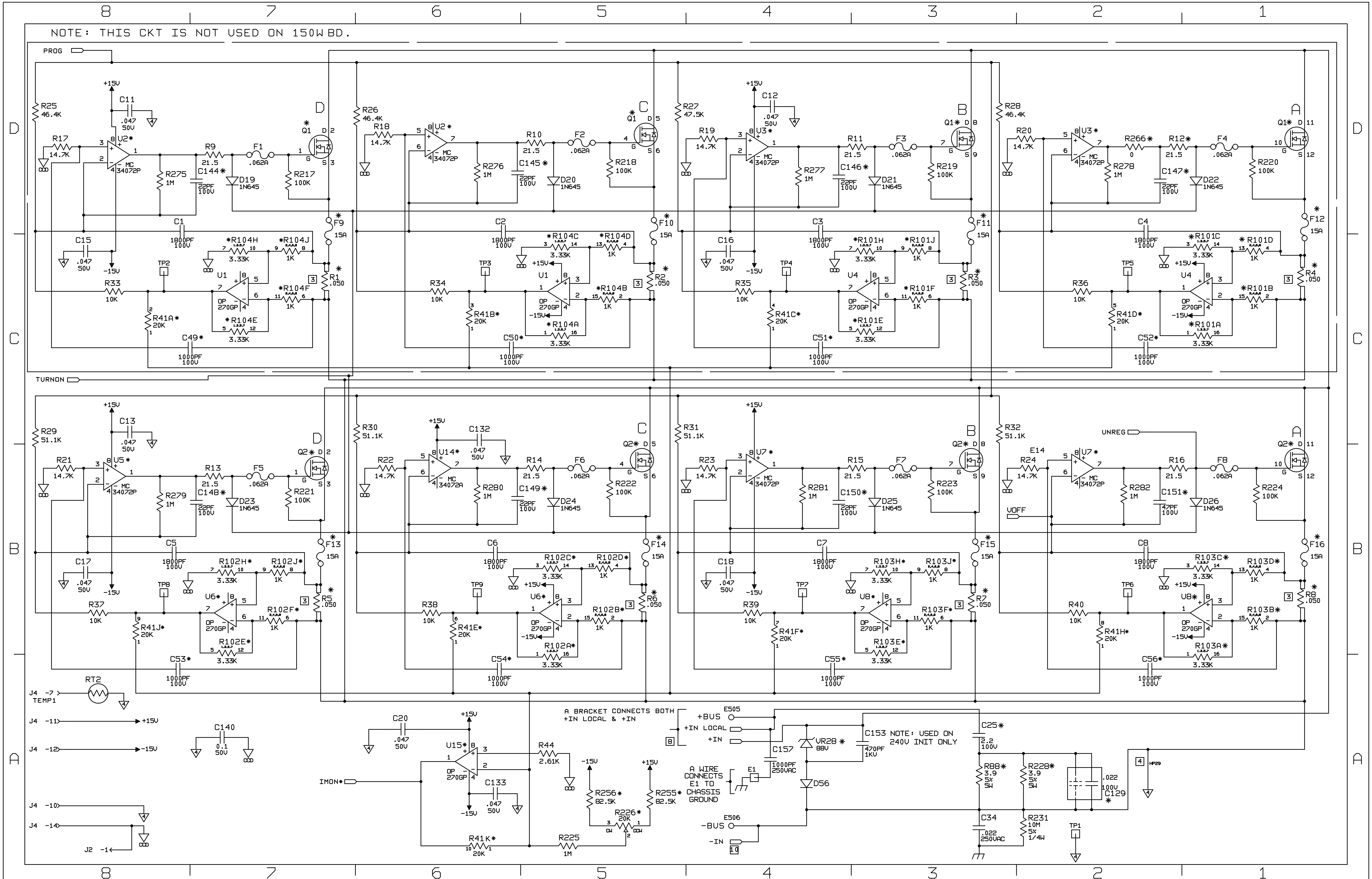
Mnemonic	Function POWER BOARD	Sheet 1	Sheet 2	Sheet 3
ACLR*	Analog circuits clear (D)	1A, 7B		
BO*	Brown out input disable (D)	1A, 2B, 8B		
+BUS	+ input binding post		4A	
- BUS	- input binding post		4A	
CC_PROG	Programming voltage for CC mode (A)	8C, 4C		
CR*	CR_mode low range select (D)	8B		
CV_PROG	Programming voltage for CV mode (A)	8D		
E2	Electrical connection	8A, 6B		
E8	Electrical connection	6A, 7D		
E11	Electrical connection	5A, 8D		
IMON*	Input-current monitor signal (A)	8B	7A	
+IN	+input (A)	8A,7A,6D,l D,lC	**4A**	
- IN	- input (A)	8A, 7A, 1D	**4A**	
+ IN Local	Same as + input (A)	1D	4A	
+ OP	Overpower comparator input (A) (low = OP)	**3A**, 8A		
- OP	Overpower comparator input (A) (high = OP)	**4A**, 8A		
OP*	Overpower status (D)	**8A**		
+OV	Overvoltage comparator input (A) (low = OV)	**4D**, 8B		
OV*	Overvoltage status (D)	**8B**		
PROG	Programming input to power circuits (A)	**5D**, 1C, 7B	8D	
	Overvoltage reference (A)	8B		
RNG	CC-mode range select (D)	8C		
R268-6	Resistor pin number	4B, 5D		
R268-8	Resistor pin number	4B, 5D		
R267-2	Resistor pin number	4C, 8D		
R267-3	Resistor pin number	4C, 8C		
R267-10	Resistor pin number	4C, 6B		
+S	Remote + sense (A) (from rear-panel +S)	1D		
- S	Remote - sense (A) (from rear-panel - S)	1D		
SPCLR*	Secondary-circuit power-on clear (D)	1B		
TEMP1	Power-board temperature (A)		8A	
TURNON	Power-on input disable (D)	**1B**	8C	
UNREG	Input to unregulated-input comparator (A)	8C, 4C	**2C**	
UNREG*	Unregulated-input status (D)	**8A**		
VMON*	Input-voltage monitor signal (A)	**8D**		
VOFF	Voltage off	5D	2B	
+12V_REF	Reference for overvoltage circuit (A)	1C		

(A) = analog signal (D) = digital signal **8C** = signal origin


RT2
Q2
Q1
Q9
Q10
Q11
Q12
R4
D56
F12
C153
VR28
R212
VR26
R211
VR10
R46
R257
R234
R235
J2
R43
C128
R268
R96
C156
R249
R270
R271
R283
D57
C155
VR29
R290
C135
U10
R209
R267
R142
R5
R6
R7
R8
R1
R2
R3
F13
F14
F15
F16
F9
F10
F11
R88
R228
C120
C131
R264
E2
E3
R55
R54
R91
R215
R229
R265
S1
C25
C143
R102
R103
R104
R101
C97
C18
C95
C96
U12
U17
C138
U9
U5
U6
U7
U8
U2
U1
U3
U4
C136
C130
D126
U14
R136
R255
R256
R289
R109
D33
C36
R41
C127
D62
R285
D60
R269
C154
R233
C140
R266
R108
U13
R272
U15
U16
U11
R238
R230
C157
R231
R53
R252
E1
C34
J4
R226
R143
R284
C106
C35
D58
C60
C125
R95
C141
R207
C137
C39



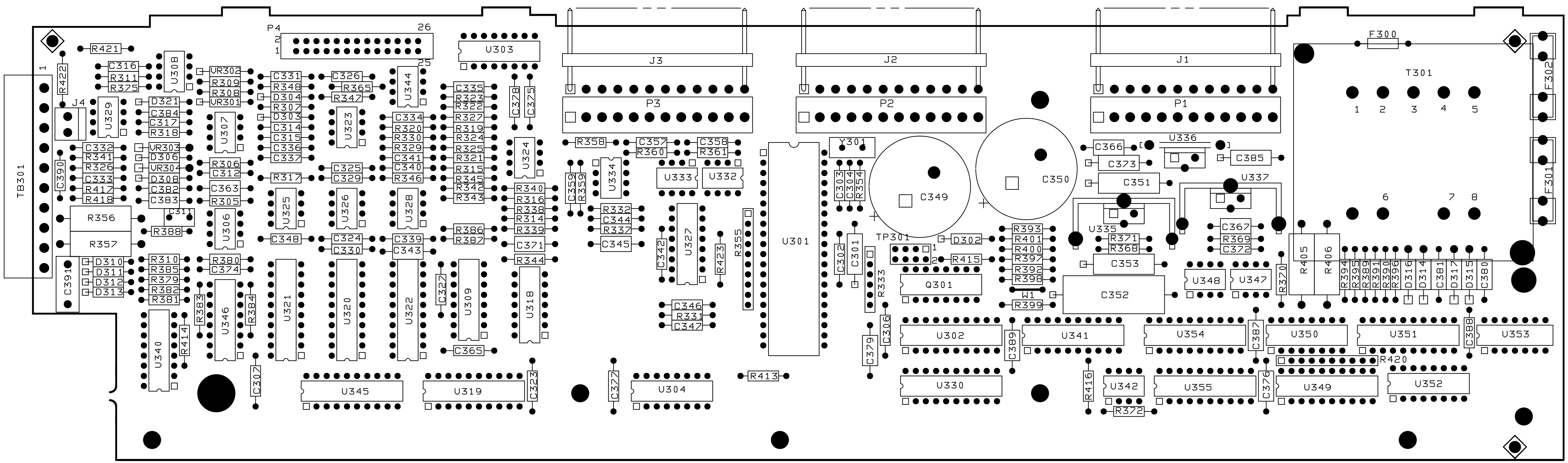
8 7 6 5 4 3 2 1
D C B A
J4 -15 VMON*
R105* 10K .1%
J4 -5 CV PROG
R117* 10K .1%
C36 1 50V E8
C106 .022 100V
R202* 2K
C35 .047 50V
E11
R201 8.25K
R106 60.4K
R108 5.11K
U13*
R143 1.5K
D28 1N645
R110 31.6K
+15V
R109 20K
R136 20K
R271 11K
R270 4.32K
U12 MC 34072P
D57
R272* 82.5K
R267-2
R267-3
C14 .047 50V
D33
R107* 12.7K
C136 .047 50V
E7
D60 1N645
R283 1.5M
VOFF
C156 1200PF 100V
R288 1.5M
R289 340K
R204 200K
U16*
R207 200K
R206* 365
C141* 0.1 50V
U9 DG211
R208 5.11K
C125* .022 100V
E3
D59 VR29
12
J4 -13 CC PROG E3
J4 -18 RNG
R68* 20K .1%
R50 51.1K
J4 -22 +5
R205* 6.81K
R284 9.31K
UNREG
D62
R285 90.9K
R66 2.15K
U15* OP 270GP
R67 1.5K
D27 1N645
C60 .022 100V
D63 1N3595
D58
R274 1.21K
C26* 4700PF 100V
E12
R69* 2.222K .1%
U12 MC 34072P
R267-10
C155 .047 50V
E2
UNREG E1
IMON*
J2 -3
J4 -6 IMON*
J4 -19 CR*
E10
R71* 2K .1%
R268-6
C138 150PF 100V
U17 LM358N
C33 .047 50V
R268-8
R65 5.11K
+0.V
D17 1N645
R64 36.5K
D18 1N645
PROG
R267
5.11K 10K 10K 16.2K 6.81K 7.5K 14.7K 2.15K
E1 UNREG
CC PROG
C134* 100PF 100V
R252* 0
R53* 60K.1%
R56* 10K .1%
U14* MC 34072A
R54* 60K.1%
C19 .047 50V
R55* 10K .1%
C130* .047 100V
R229 4.7 5% 1/4W
S1
E2 E3
R265 0
R264 0
J4 -1 +S
J4 -4 -S
LOCAL
REMOTE
-IN
+IN LOCAL
C131 .047 100V
R230 4.7 5% 1/4W
-IN
J4 -9 +12V REF
PROG
-15VX
R58* 33K
D35 1N645
R238 1K
U5* MC 34072P
D55 1N645
C143 220PF 100V
R144 14K
Q11 2N2907A
R213* 42.2K
C126 .22 50V
R59* 47.5K
R214* 42.2K
D54 1N645
R234 3.16K
Q12
C142 .022 100V
R91* 0
R215* 75K
D53 1N645
R216 1.78K
R239 162
R60 576
VR27 6.2V
R235 6.81K
+IN LOCAL
C128 .047 50V
J4 -21 SPCLR*
Q12
R43 10.0K
R151 31.6K
BO*
TURNON
Q9 2N4392
VR10 16V
Q10
R46 5.11K
D10 1N645
R257 10K
J4 -17 ACLR*
VR26 9.09V 5%
R212 6.81K
R211 1.78K
C139 .01 100V
-15VX
+0.P
R116 200K
C38 .047 50V
R261 10K
R262 6.49K
R233 10K
R263 12.1K
U11
Iset V+
VE V-
+0.V
R269 10K
PROG
R259 10K
ACLR*
J4 -26 OV*
J4 -25 BO*
J4 -24 OP*
J4 -23 UNREG*
+0.P
-0.P
E2
C154 .01 100V
C152 4700PF 100V
C137 .01 100V
R114 16.2K
R115 511
C39 .047 50V
R96* 60K.1%
R249* 0
R90* 10K .1%
U17 LM358N
R93* 1.96K
C32 .047 50V
C42 .047 50V
C41 .047 50V
C40 .047 50V
R94 20K
R92* 1.96K
R142
69.89K 100K 14.96K 51.74K 100K 129.9K 134.7K 55.7K 100K 100K 15.95K 71.81K
U10
R268
31.6K 14K 1K 51.1K 51.1K
R290* 56.2K
C135 2200PF 100V
D11 1N645
R209 4.7 5% 1/4W
C21 .047 50V
Q12-16
R95 1K
C127 0.1 50V
E11
E8
+IN
-IN



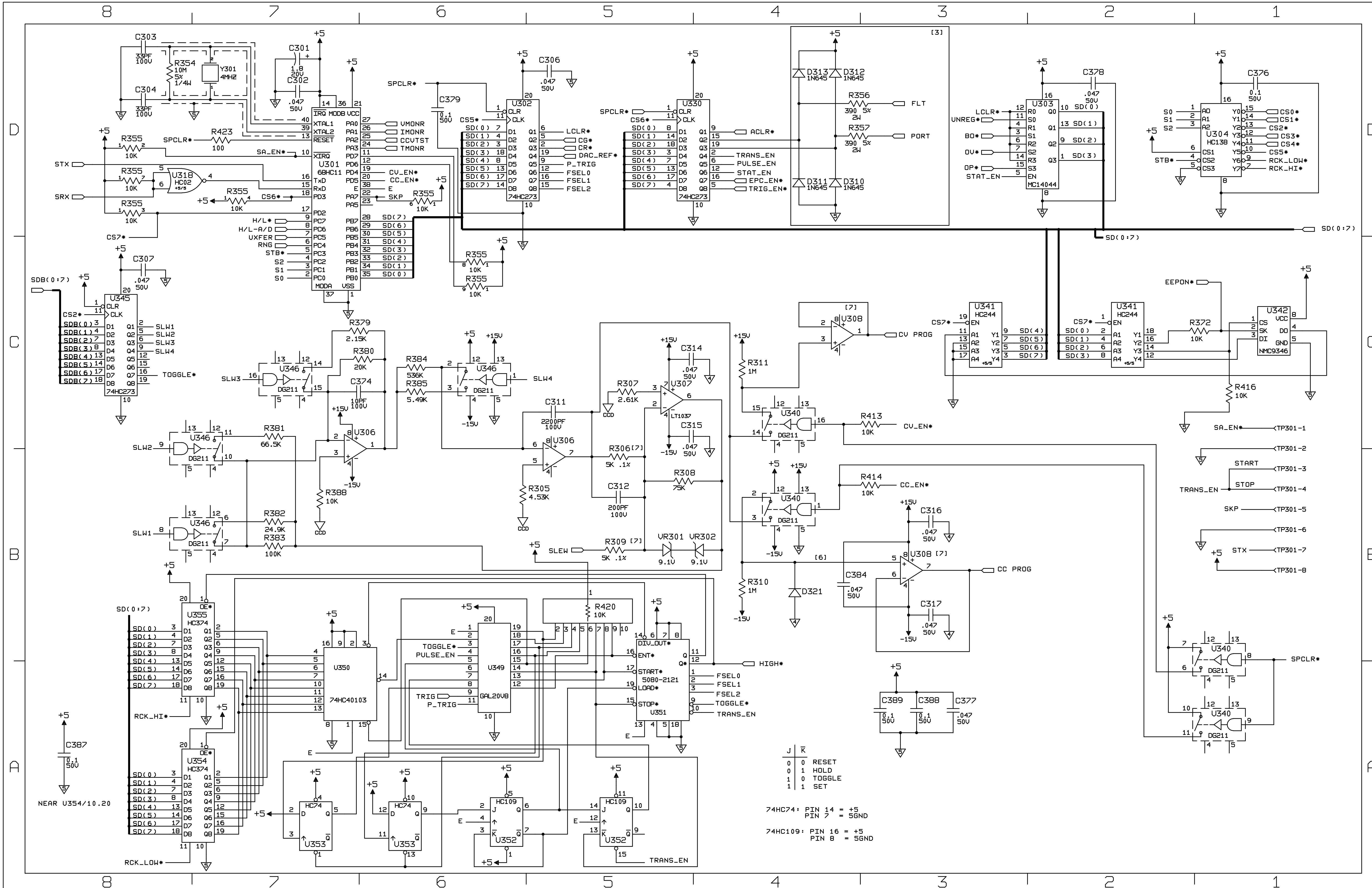
NOTE: THIS CKT IS NOT USED ON 150W BD.
8
7
6
5
4
3
2
1
D
C
B
A
PROG
TURNON
UNREG
VOFF
+15V
-15V
C11 .047 50V
C12 .047 50V
C13 .047 50V
C15 .047 50V
C16 .047 50V
C17 .047 50V
C18 .047 50V
R25 46.4K
R26 46.4K
R27 47.5K
R28 46.4K
R29 51.1K
R30 51.1K
R31 51.1K
R32 51.1K
R17 14.7K
R18 14.7K
R19 14.7K
R20 14.7K
R21 14.7K
R22 14.7K
R23 14.7K
R24 14.7K
E14
U2* MC 34072P
U3* MC 34072P
U5* MC 34072P
U14* MC 34072A
U7* MC 34072P
R9 21.5
R10 21.5
R11 21.5
R12* 21.5
R13 21.5
R14 21.5
R15 21.5
R16 21.5
R266* 0
F1 .062A
F2 .062A
F3 .062A
F4 .062A
F5 .062A
F6 .062A
F7 .062A
F8 .062A
Q1* D
Q1* C
Q1* B
Q1* A
Q2* D
Q2* C
Q2* B
Q2* A
R217 100K
R218 100K
R219 100K
R220 100K
R221 100K
R222 100K
R223 100K
R224 100K
R275 1M
R276 1M
R277 1M
R278 1M
R279 1M
R280 1M
R281 1M
R282 1M
C144* 22PF 100V
C145* 22PF 100V
C146* 22PF 100V
C147* 22PF 100V
C148* 22PF 100V
C149* 22PF 100V
C150* 22PF 100V
C151* 47PF 100V
C132 .047 50V
D19 1N645
D20 1N645
D21 1N645
D22 1N645
D23 1N645
D24 1N645
D25 1N645
D26 1N645
F9 15A
F10 15A
F11 15A
F12 15A
F13 15A
F14 15A
F15 15A
F16 15A
R1 .050
R2 .050
R3 .050
R4 .050
R5 .050
R6 .050
R7 .050
R8 .050
C1 1800PF 100V
C2 1800PF 100V
C3 1800PF 100V
C4 1800PF 100V
C5 1800PF 100V
C6 1800PF 100V
C7 1800PF 100V
C8 1800PF 100V
*R104H 3.33K
*R104J 1K
*R104F 1K
*R104E 3.33K
*R104C 3.33K
*R104D 1K
*R104B 1K
*R104A 3.33K
*R101H 3.33K
*R101J 1K
*R101F 1K
*R101E 3.33K
*R101C 3.33K
*R101D 1K
*R101B 1K
*R101A 3.33K
R102H* 3.33K
R102J* 1K
R102F* 1K
R102E* 3.33K
R102C* 3.33K
R102D* 1K
R102B* 1K
R102A* 3.33K
R103H* 3.33K
R103J* 1K
R103F* 1K
R103E* 3.33K
R103C* 3.33K
R103D* 1K
R103B* 1K
R103A* 3.33K
U1 OP 270GP
U4 OP 270GP
U6* OP 270GP
U8* OP 270GP
TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP8
TP9
R33 10K
R34 10K
R35 10K
R36 10K
R37 10K
R38 10K
R39 10K
R40 10K
R41A* 20K
R41B* 20K
R41C* 20K
R41D* 20K
R41J* 20K
R41E* 20K
R41F* 20K
R41H* 20K
C49* 1000PF 100V
C50* 1000PF 100V
C51* 1000PF 100V
C52* 1000PF 100V
C53* 1000PF 100V
C54* 1000PF 100V
C55* 1000PF 100V
C56* 1000PF 100V
J4 -7 TEMP1
RT2
J4 -11 +15V
J4 -12 -15V
J4 -10
J4 -14
J2 -1
C140 0.1 50V
C20 .047 50V
U15* OP 270GP
C133 .047 50V
IMON*
R44 2.61K
R41K* 20K
R225 1M
R256* 82.5K
R255* 82.5K
R226* 20K
CW
CCW
A BRACKET CONNECTS BOTH +IN LOCAL & +IN
+BUS
+IN LOCAL
+IN
E505
E506
-BUS
-IN
A WIRE CONNECTS E1 TO CHASSIS GROUND
E1
C157 1000PF 250VAC
VR28* 88V
D56
C153 470PF 1KV
NOTE: USED ON 240V INIT ONLY
C25* 2.2 100V
R88* 3.9 5% 5W
R228* 3.9 5% 5W
C129* .022 100V
C34 .022 250VAC
R231 10M 5% 1/4W
HP29

REF/DES	MODEL NUMBER		
	60502(60V)	60501(60V)	60503(240V)
R53	60 K .1%	60 K .1%	150K .1%
R54	60 K .1%	60 K .1%	300K .1%
R55	10 K .1%	10 K .1%	12.5K.1%
R56	10 K .1%	10 K .1%	12.5K.1%
R58	33 K	33K	31.6K
R59	47.5K	47.5K	45.3K
R90	10 K .1%	10 K .1%	12.5K .1%
R91	0	0	287K
R92	1.96K	1.96K	3.83K
R93	1.96K	1.96K	3.83K
R96	60 K .1%	60 K .1%	150K .1%
R97	0	0	1M
R105	10K	10K	5K
R107	12.7K	12.7K	5.11K
R117	10 K .1%	10 K .1%	5K
R205	6.81K	6.81K	1.87K
R206	365	365	100
R213	42.2K	42.2K	45.3K
R214	42.2K	42.2K	51.1K
R215	75K	75K	249K
C5-C8	1800PF	1800PF	1800PF
R249	0	0	150K .1%
R252	0	0	150K .1%
C151	47PF	33PF	33PF
C1-4	1800 PF100V	N/A	1800 PF100V
C11,12	0.047 50V	N/A	0.047 50V
C15,16	0.047 50V	N/A	0.047 50V
C25	2.2 100V	2.2 100V	1 400V
C49-52	330 PF 100V	N/A	330 PF 100V
C129	.022 100V	.022 100V	.02 500V
C130	0.047 100V	0.047 100V	.05 400V
C144-146	22 PF 100V	N/A	33 PF 100V
C147	22 PF 100V	N/A	33 PF 100V
C148-150	22 PF 100V	22 PF 100V	33 PF 100V
D1-4	1N645	N/A	1N645
D19-22	1N645	N/A	1N645
F1-4	0.062 A	N/A	0.062 A
F9-12	15 A	N/A	7A
F13-16	15 A	15 A	7A
Q1	4XIRF540	N/A	4XIRF740
Q2	4XIRF540	4XIRF540	4XIRF740
R1-4	0.050	N/A	0.30
R5-8	0.050	0.050	0.30
R9-11	21.5	N/A	21.5
R12	21.5	N/A	21.5
R17-20	14.7K	N/A	14.7K
R25,R26,	46.4K	N/A	46.4K
R28	46.4K	N/A	46.4K
R27	47.5K	N/A	47.5K
R33-36	10K	N/A	10K
R266	0	N/A	0
R88	3.9 5% 5W	3.9 5% 5W	4.3 5% 2W
R272	36.5K	36.5K	10 K
R217-220	100K	N/A	100K
R228	3.9 5% 5W	3.9 5% 5W	4.3 5% 2W
U1,4	OP270GP	OP270GP	OP270GP
VR28	88V 5%	88V 5%	300V 5%

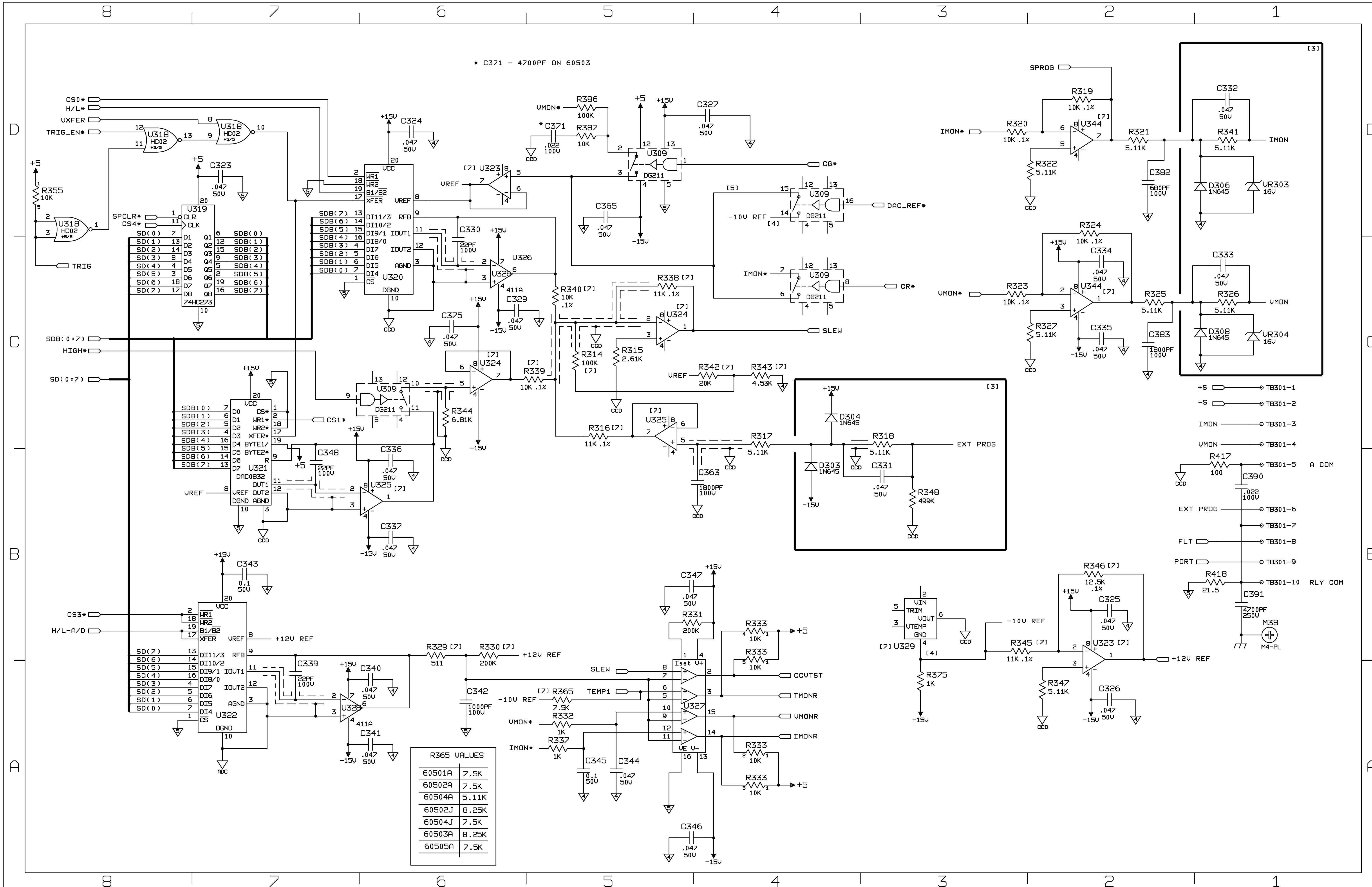
REF/DES	MODEL NUMBER		
	60502(60V)	60501(60V)	60503(240V)
U6,U8	OP270GP	OP270GP	OP270GP
U13	LF412	LF412	LF412
U16	LF412	LF412	LF412
U2,3	MC34072P	N/A	MC34072P
U14	MC34072A	MC34072A	MC34072A
U5,7	MC34072P	MC34072P	MC34072P
R41A	20K	N/A	20K
R41B	20K	N/A	20K
R41C	20K	N/A	20K
R41D	20K	N/A	20K
R41E	20K	10K	20K
R41F	20K	10K	20K
R41H	20K	10K	20K
R41J	20K	10K	20K
R41K	20K	20K	20K
R102A	3.33K	3.33K	3.33K
R102C	3.33K	3.33K	3.33K
R102E	3.33K	3.33K	3.33K
R102H	3.33K	3.33K	3.33K
R102B	1K	1K	1K
R102D	1K	1K	1K
R102F	1K	1K	1K
R102J	1K	1K	1K
R103A	3.33K	3.33K	3.33K
R103C	3.33K	3.33K	3.33K
R103E	3.33K	3.33K	3.33K
R103H	3.33K	3.33K	3.33K
R103B	1K	1K	1K
R103D	1K	1K	1K
R103F	1K	1K	1K
R103J	1K	1K	1K
R101A	3.33K	N/A	3.33K
R101C	3.33K	N/A	3.33K
R101E	3.33K	N/A	3.33K
R101H	3.33K	N/A	3.33K
R101B	1K	N/A	1K
R101D	1K	N/A	1K
R101F	1K	N/A	1K
R101J	1K	N/A	1K
R104A	3.33K	N/A	3.33K
R104C	3.33K	N/A	3.33K
R104E	3.33K	N/A	3.33K
R104H	3.33K	N/A	3.33K
R104B	1K	N/A	1K
R104D	1K	N/A	1K
R104F	1K	N/A	1K
R104J	1K	N/A	1K
R255	82.5K	82.5K	82.5K
R256	82.5K	82.5K	82.5K
R202	2K	2K	1.33K
C125	.022	.015	.015
U15	OP270GP	OP270GP	OP270GP
R290	56.2K	56.2K	51.1K
C141	.1	.1	N/A
C49-C56	1000PF	330PF	330PF



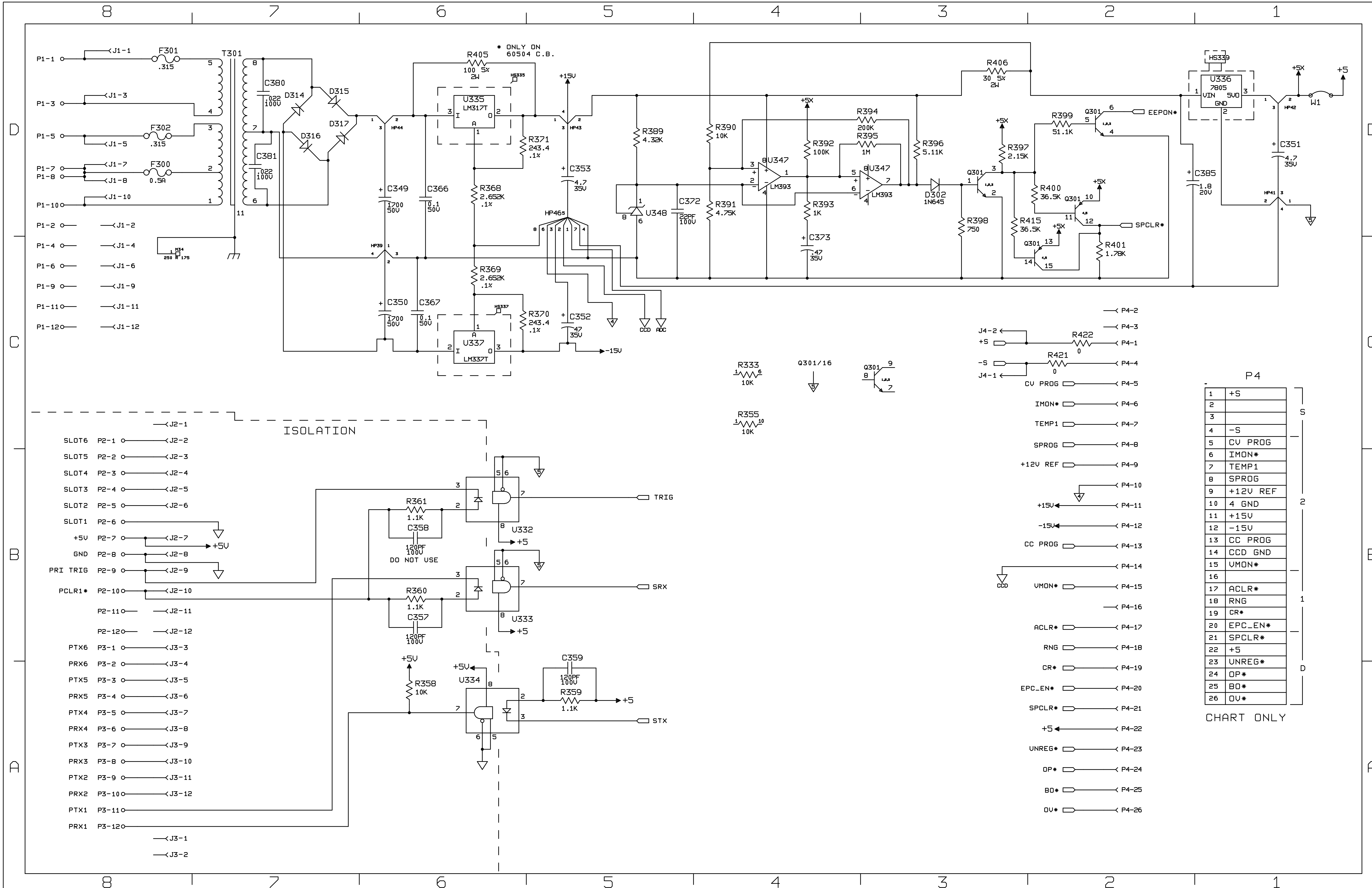
TB301
1
R422
J4
C390
C391
R421
C316
R311
R375
U308
U329
D321
C384
C317
R318
C332
R341
R326
C333
R417
R418
VR303
D306
VR304
D308
C382
C383
C311
R356
R357
R388
D310
D311
D312
D313
R310
R385
R379
R382
R381
R383
R414
U340
VR302
R309
R308
VR301
U307
R306
C312
C363
R305
U306
R380
C374
U346
R384
C307
P4
2
1
26
25
C331
R348
D304
R307
D303
C314
C315
C336
C337
R317
U325
C348
U321
C326
R365
R347
U323
C325
C329
U326
C324
C330
U320
U344
C334
R320
R330
R329
C341
C340
R346
U328
C339
C343
U322
U345
U303
C335
R323
R322
R327
R319
R324
R325
R321
R315
R345
R342
R343
R386
R387
C327
U309
C365
U319
C378
C375
U324
R340
R316
R338
R314
R339
C371
R344
U318
C323
J3
P3
R358
C359
R359
U334
R332
C344
R337
C345
C377
U304
C357
R360
C358
R361
U333
U332
C342
U327
R423
C346
R331
C347
R355
R413
U301
J2
P2
Y301
C303
C304
R354
C302
C301
R333
C306
C379
TP301
1
2
C349
C350
D302
R415
Q301
U302
U330
R393
R401
R400
R397
R392
R398
W1
R399
C389
U341
R416
U342
R372
J1
P1
C366
U336
C385
C373
C351
U337
U335
R371
R368
C353
C352
C367
R369
C372
U348
U347
U354
U355
C387
C376
R370
U350
U349
R420
R405
R406
R394
R395
R389
R391
R390
R396
D316
D314
C381
D317
D315
C380
U351
U352
C388
U353
F300
T301
1
2
3
4
5
6
7
8
F302
F301



U301 68HC11
U302 74HC273
U330 74HC273
D313 D312 1N645
D311 D310 1N645
R356 390 5% 2W
R357 390 5% 2W
FLT
PORT
U303 MC14044
U304 HC138
Y301 4MHZ
R354 10M 5% 1/4W
C303 33PF 100V
C304 33PF 100V
C301 1.8 20V
C302 .047 50V
C306 .047 50V
C379 .1 50V
C378 .047 50V
C376 0.1 50V
SPCLR*
STX
SRX
CS7*
SA_EN*
VMONR
IMONR
CCVTST
TMONR
CV_EN*
CC_EN*
SKP
H/L*
H/L-A/D
UXFER
RNG
STB*
S2
S1
S0
LCLR*
CG*
CR*
DAC_REF*
P_TRIG
FSEL0
FSEL1
FSEL2
ACLR*
TRANS_EN
PULSE_EN
STAT_EN
EPC_EN*
TRIG_EN*
UNREG*
BO*
OV*
OP*
CS0* CS1* CS2* CS3* CS4* CS5*
RCK_LOW*
RCK_HI*
SD(0:7)
SDB(0:7)
U345 74HC273
SLW1 SLW2 SLW3 SLW4
TOGGLE*
U346 DG211
U306
U307 LT1037
U308
U340 DG211
U341 HC244
U342 NMC9346
EEPON*
CV PROG
CC PROG
SLEW
VR301 VR302 9.1V
D321
R311 1M
R310 1M
R413 10K
R414 10K
R416 10K
R372 10K
TP301-1 SA_EN*
TP301-2
TP301-3 START
TP301-4 STOP TRANS_EN
TP301-5 SKP
TP301-6
TP301-7 STX
TP301-8
U355 HC374
U354 HC374
U350 74HC40103
U349 GAL20V8
U351 5080-2121
R420 10K
HIGH*
TRIG
U353 HC74
U352 HC109
C389 0.1 50V
C388 0.1 50V
C377 .047 50V
C387 0.1 50V
NEAR U354/10.20
J K
0 0 RESET
0 1 HOLD
1 0 TOGGLE
1 1 SET
74HC74: PIN 14 = +5
PIN 7 = 5GND
74HC109: PIN 16 = +5
PIN 8 = 5GND



R365 VALUES	
60501A	7.5K
60502A	7.5K
60504A	5.11K
60502J	8.25K
60504J	7.5K
60503A	8.25K
60505A	7.5K



ISOLATION
* ONLY ON 60504 C.B.
P1-1
P1-3
P1-5
P1-7
P1-8
P1-10
P1-2
P1-4
P1-6
P1-9
P1-11
P1-12
J1-1
J1-3
J1-5
J1-7
J1-8
J1-10
J1-2
J1-4
J1-6
J1-9
J1-11
J1-12
F301 .315
F302 .315
F300 0.5A
T301
C380 .022 100V
C381 .022 100V
D314
D315
D316
D317
R405 100 5% 2W
U335 LM317T
HS335
R371 243.4 .1%
R368 2.652K .1%
R369 2.652K .1%
R370 243.4 .1%
U337 LM337T
HS337
C349 1700 50V
C366 0.1 50V
C350 1700 50V
C367 0.1 50V
C353 4.7 35V
C352 47 35V
+15V
-15V
HP44
HP43
HP39
HP46
CCD
ADC
R389 4.32K
U348
C372 22PF 100V
R390 10K
R391 4.75K
U347 LM393
R392 100K
R393 1K
C373 .47 35V
R394 200K
R395 1M
R396 5.11K
R406 30 5% 2W
D302 1N645
R398 750
Q301
R397 2.15K
R399 51.1K
EEPON*
R400 36.5K
R415 36.5K
R401 1.78K
SPCLR*
HS339
U336 7805
VIN 5VO GND
C385 1.8 20V
C351 4.7 35V
HP42
HP41
W1
+5X
+5
R333 10K
R355 10K
Q301/16
J4-2
+S
-S
J4-1
R422 0
R421 0
P4-1
P4-2
P4-3
P4-4
P4-5
P4-6
P4-7
P4-8
P4-9
P4-10
P4-11
P4-12
P4-13
P4-14
P4-15
P4-16
P4-17
P4-18
P4-19
P4-20
P4-21
P4-22
P4-23
P4-24
P4-25
P4-26
CV PROG
IMON*
TEMP1
SPROG
+12V REF
CC PROG
VMON*
ACLR*
RNG
CR*
EPC_EN*
UNREG*
OP*
BO*
OV*
P4
1 +S
2
3
4 -S
5 CV PROG
6 IMON*
7 TEMP1
8 SPROG
9 +12V REF
10 4 GND
11 +15V
12 -15V
13 CC PROG
14 CCD GND
15 VMON*
16
17 ACLR*
18 RNG
19 CR*
20 EPC_EN*
21 SPCLR*
22 +5
23 UNREG*
24 OP*
25 BO*
26 OV*
CHART ONLY
SLOT6 P2-1
SLOT5 P2-2
SLOT4 P2-3
SLOT3 P2-4
SLOT2 P2-5
SLOT1 P2-6
+5V P2-7
GND P2-8
PRI TRIG P2-9
PCLR1* P2-10
P2-11
P2-12
PTX6 P3-1
PRX6 P3-2
PTX5 P3-3
PRX5 P3-4
PTX4 P3-5
PRX4 P3-6
PTX3 P3-7
PRX3 P3-8
PTX2 P3-9
PRX2 P3-10
PTX1 P3-11
PRX1 P3-12
J2-1
J3-1
J3-2
R361 1.1K
C358 120PF 100V
DO NOT USE
U332
TRIG
R360 1.1K
C357 120PF 100V
U333
SRX
R358 10K
U334
C359 120PF 100V
R359 1.1K
STX